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CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

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CAR AND LOCOMOTIVE OUTPUT IN 1907.

Last year when the output of the car and locomotive builders in the United States and Canada was compiled, the returns indicated that in spite of the record breaking production of 1906 a still larger output would be recorded for 1907. Some of the companies reported last year that they had unfilled orders on their books for 1907 delivery for a greater number of cars than they had built during 1906 and orders were being placed for delivery from nine months to a year in advance. Last spring when the financial situation became acute and the railroads as well as the industrial corporations began to feel the effects of hard times, it was generally expected that many of the large orders for cars to be delivered during the last months of the year would be cancelled. New orders dropped off to very small figures, but few standing orders were actually cancelled and the car and locomotive builders have continued through the year working practically to their full capacity. In order to compare the business situation at this time with the business situation last year, the builders were asked this year to state the number of unfilled orders on their books as compared with the number of unfilled orders on their books a year ago. Almost without exception both the car and locomotive builders in the United States report a heavy falling off in orders and inquiries, and many of them are running now on orders placed last spring with no new work in prospect. One of the large locomotive building companies reported a falling off of 75 per cent. in orders, as compared with last year. The Canadian car and locomotive builders have not felt the effect of the disturbance in financial and business conditions to any extent. All of the companies report as many or more unfilled orders on their books now as they reported last year.

Official returns from 36 car building companies in the United States and Canada (estimating two small plants not heard from) give the total number of railroad cars built during 1907 as 289,645, an increase of 19 per cent. over the record breaking output of last year. This includes subway and elevated cars, but does not include electric street and interurban cars. No estimate has been made of the number of cars, both freight and passenger, built by the railroads in their own shops. Of the total number of cars built by manufacturers 284,188 were for freight service and 5,457 for passenger service; 280,216 were for domestic use and 9,429 for export. The number of passenger cars built during the year shows an increase of more than 70 per cent. over last year's output. About 72 per cent. of the freight cars built were of steel or steel underframe construction. Canada built 9,159 freight cars and 106 passenger cars, an increase of 30 per cent. over last year's output; all of these cars were for domestic use. The one company building cars in Mexico retired from business during the year and no returns were received from it. The following table shows the *Railroad Gazette's* compilation of the number of cars built during the last nine years:

Year.	Freight.	Passenger.	Total.
1899	119,886	1,305	121,191
1900	115,631	1,636	117,267
1901	136,950	2,055	139,005
1902	162,599	1,948	164,547
1903	153,195	2,007	155,202
1904	60,806	2,144	62,950
1905	165,455	2,551	*168,006
1906	240,503	3,167	*243,670
1907	284,188	5,457	*289,645

*Includes Canadian output.

The locomotive output shows a smaller increase over last year than the car building output. This is probably due to the fact that the locomotive builders worked their plants practically to their full capacity last year and were unable because of lack of manufacturing facilities to turn out any large increase over last year's figure. The 12 builders in the United States and Canada built 7,362 locomotives during the year, of which 6,564 were for domestic use and 798 for export. This is an increase of 6 per cent. in the total output; the export output increased 11 per cent., as against 5 per cent. for the domestic output. These figures, as in the case of the totals of cars built, do not include locomotives built in railroad shops or locomotives rebuilt or repaired. There were 330 electric locomotives and 240 compound locomotives built, as against 237 and 292 respectively last year. The Canadian output of locomotives was 264. The following table shows the number of locomotives built during the last 15 years:

Year.	No. built.	Year.	No. built.	Year.	No. built.	Year.	No. built.
1893	2,011	1897	1,251	1901	3,384	1905	*5,491
1894	695	1898	1,875	1902	4,070	1906	*6,952
1895	1,101	1899	2,475	1903	5,152	1907	*7,362
1896	1,175	1900	3,153	1904	3,441		

*Includes Canadian output.

The cost of cars and locomotives has increased slightly over last year. Estimating the average cost of freight cars at $1,100, the total spent for freight cars amounts to $312,607,000; for passenger cars at $8,500 the cost was $46,384,000, and for locomotives at $16,000 the cost was $117,792,000. The increase in the cost of locomotives is due largely to the increased average weight of modern

locomotives. The total amount spent by the railroads for new rolling stock and locomotive power approximates this year $477,000,000, an increase of about 25 per cent. over last year.

RAILROAD BUILT IN 1907.

The new mileage added during the past year, although somewhat less than that for the unusually prosperous year 1906 which was the largest since 1903, is as much as could be expected when the changing and adverse conditions that prevailed during this period are considered. Official returns from nearly all the railroads, supplemented by our own records and figures furnished by the State Railroad Commissions, show that approximately 5,212 miles of new railroad line were built in the United States during the calendar year 1907. These figures include 14 miles of new main track relocated, but do not include new second, third or fourth track, sidings or electric lines. The total is 7½ per cent. less than was built in 1906. Conditions at the close of last year indicated that the mileage for this year would exceed that of the previous year, as a large amount of grading had been finished ready for the track and many new projects were contemplated. During the early part of the year the railroads were not able to get all the labor and supplies necessary to carry out the authorized work. Soon the railroad legislation in various states and the difficulty of borrowing money, resulted in suspension of new work by a number of companies. Considerable progress was, however, made in permanent improvements to roadbed, particularly straightening the lines and reducing grades.

The joint low grade line of the Great Northern and the Northern Pacific, from Kennewick, Wash., west to Vancouver, 220 miles, constructed under the name of the Portland & Seattle, was the longest single stretch of new road built. Work is being pushed by the Chicago, Milwaukee & St. Paul on its Pacific extension. In 1906, there were 39 miles of track laid and 298 miles were added in 1907, leaving between 1,100 and 1,200 miles yet to be built to finish the line to Seattle. The Kansas City, Mexico & Orient built 47 miles in Oklahoma, 25 in Texas and 18 in Mexico. There are over 900 miles yet to be built to finish the line from Kansas City through to Topolebampo, on the west coast of Mexico. On the Western Pacific all of the road in Utah, 122 miles, has been finished, in Nevada 39 miles of track have been laid, and 102 in California, leaving 577 miles yet to be built.

In Canada, the Grand Trunk Pacific has made its full surveys from Moncton, N. B., west to Winnipeg, Man., 1,800 miles, and has let contracts for 852 miles of line on this section. In the West, contracts are let to the Rocky mountains, except for about 125 miles, for which contracts will shortly be let. It was definitely decided this year that the line would cross the main range of the Rockies through Yellowhead Pass. Up to April of this year only 36 miles of track had been laid, but track has been laid on 325 miles west of Winnipeg and on 100 miles of the Fort William branch. The Canadian Northern recently finished a connecting line from Brandon, Man., west to Regina, Sask., 175 miles, and has projected a large number of other extensions. The Canadian Pacific has built a long extension from the East to Saskatoon, Sask., which is being extended 325 miles beyond that point to Wetaskiwin, Alb., on the Edmonton branch. Beyond Saskatoon, 26 miles of track have been laid and the grading is 95 per cent. finished. Though not included in its total, one of the most important construction works carried out by this company has been the completion of the double track between Winnipeg and Fort William, a greatly congested section of its through line. In Mexico the Southern Pacific built 205 miles on the west coast during the year and is pushing work from San Blas, which is on the Kansas City, Mexico & Orient, down the west coast to Guadalajara, 650 miles.

New main track mileage is reported in 44 states and territories, including Alaska, where 90 miles of new track were built. Louisiana, which was third in 1906, was first this year with 384 miles. Texas, South Dakota and Washington came next in order, each with between 340 and 320 miles. In 1906 Texas was first with 635 miles, far ahead of the record of any state in 1907. Besides Texas with its decrease of nearly 300 miles, Arkansas, Illinois, Nebraska each show at least 100 miles less than last year. The largest decrease in 1906 was in North Dakota, where only 247 miles were built, as compared with 521 in 1905. In addition to the states already mentioned, which lead the list, Alabama, Arkansas, Georgia, Idaho, Indiana, Minnesota, Mississippi, Montana, North Carolina, North Dakota, Oklahoma, Pennsylvania, Virginia, West Virginia and Wisconsin, each built over 100 miles of main line in 1907. No new mileage was reported in Connecticut, Delaware, Iowa, Massachusetts, New Hampshire, Rhode Island or Vermont.

The number of miles built in Canada was 977, a small decrease as compared with 1906, when 1,007 miles were built. The number of miles built in Mexico was 333 as against 297 in 1906.

The following table shows our figures for mileage built in the United States during the last 15 years:

1893.....3,024	1898.....3,265	1903.....5,652
1894.....1,760	1899.....4,569	1904.....3,832
1895.....1,428	1900.....4,894	1905.....4,388
1896.....1,692	1901.....5,368	1906.....5,623
1897.....2,109	1902.....6,026	1907.....5,212

RECEIVERSHIPS AND FORECLOSURE SALES IN 1907.

The receivership record of 1907, in spite of the great financial disturbances and the banking panic in the latter part of the year, is an unusually clear one. Only 349 miles of railroad went into the hands of receivers during 1907, which is the smallest mileage since 1903. It is to be hoped that the year 1908 will have an equally clear record, although there is no doubt that it will be a time of test and trial. The encouraging feature of the situation is that expenditures for additions and betterments during the last few years have generally been so large and so continuous that the average railroad is in a strong position to meet a curtailment of traffic. In 1906 there were 657 miles of road which suffered receivership. Up to December 26 of that year there were only 254 miles of road so affected, but on that day receivers were appointed for the Mobile, Jackson & Kansas City and its subsidiary, the Gulf & Chicago, adding 403 miles to the total. As the receivership of the parent road was terminated four days later, on December 31, 1906, these receiverships were in reality unimportant. In 1905 3,593 miles of railroad entered receivership, this large figure being the result of the Cincinnati, Hamilton & Dayton and Pere Marquette troubles. In 1904 there were 744 miles, of which the largest railroad was the Detroit Southern, now the Detroit, Toledo & Ironton. In 1903 there were 229 miles involved; in 1902, 278 miles, and in 1901, 73 miles. Back of this year as far as 1882 was a long period during which the annual mileage of new receiverships ran into the thousands, with the climax in 1893 with over 29,000 miles.

The largest railroad which went into the hands of receivers during 1907 was the Chattanooga Southern, which owns 99 miles from Chattanooga, Tenn., south through the northeastern corner of Georgia to Gadsden, Ala. This is said to have occurred because some of the stockholders were unwilling to agree to terms offered by the Louisville & Nashville for purchase of the securities of the road. The next largest road was the Apalachicola Northern, an 80-mile line from River Junction, Fla., to Apalachicola, for which receivers were appointed in September. The Colorado & Northwestern runs from Boulder, Colo., to Ward and from Sunset to Eudora, a total of 48 miles. It was previously sold under foreclosure in 1904. The Missouri River & Northwestern has 35 miles of line built from Rapid City, S. Dak., to Mystic in the Black Hills region. It also was reorganized in 1904, its predecessor company being the Dakota Pacific Railroad. Its road, however, was not opened throughout until 1906. There was no default of interest on its bonds, but the present receivership came as a result of difficulties among the stockholders, following damage done to the property during the severe weather of last winter. As soon as possible it is planned to extend the line 50 miles beyond Mystic to coal areas in Wyoming. The Council City & Solomon River is an Alaskan road which has been building a few miles each year until it now has 35 miles of line from Dickson, Alaska, to Penelope Creek. This receivership was due to the claims of construction companies; these have since been adjusted. The receivership of the North-East Texas, an 18-mile lumber road, from Red Water, Tex., to Munz, was due to the burning of a sawmill on which the road depended for most of its traffic. The Ione & Eastern has 13 miles of line from Ione, Cal., to Martell. The Medford & Crater Lake runs from Medford, Ore., to Eagle Point, 11 miles. It was in receiver's hands only a short time, for on May 11 it was sold under foreclosure, as shown below, to the Pacific & Eastern, the successor company. The Alabama Central runs from Booth, Ala., to Autaugaville, 9 miles.

The most important receiverships of the year are not included in the list because they were not of steam railroads, but of street railway companies. On September 24 Adrian H. Joline and Douglas Robinson were appointed, by the Federal court, receivers of the New York City Railway and on October 2 the Metropolitan Street Railway was also put in their hands as receivers. The New York City Railway is the lessee of the Metropolitan Street Railway and operates the surface lines in the boroughs of Manhattan and the Bronx, New York City, and also controls considerable trolley mileage north of the city limits. This receivership involved a clash of

jurisdiction, for on November 29 three receivers for each of these companies were appointed by the Attorney-General of the state of New York. These state receivers were, however, on December 12 restrained by the United States court from taking possession.

The following table lists in the order of their occurrence the receiverships of the year:

Receiverships.

Name.	Mileage.	Bonds.	Stock.	Date of receivership.
Alabama Central	9	.....	.....	Jan. 21.
Mo. River & Northwestern.	35	$700,000	$1,000,000	Feb. 14.
Medford & Crater Lake ...	11	.....	200,000	April.
North-East Texas	18	80,000*	250,000	Apr. 13.
Chattanooga Southern	94	.....	3,000,000	Apr. 23.
Colorado & Northwestern...	54	1,000,000	1,000,000	June
Apalachicola Northern	80	.....	.....	Sept.
Ione & Eastern	13	360,000	50,000	Sept. 10.
Council City & Solomon Rvr	35	347,000	895,460	Oct. 11.
Totals	349	$2,487,000	$6,395,460	

*About.

There were only six roads sold under foreclosure during 1907, with a total mileage of 175 miles. Of these the most important were two terminal railroads, both of which were among the roads which went into the hands of receivers during 1906. The Toledo Railway & Terminal had been taken over by the Cincinnati, Hamilton & Dayton-Pere Marquette combination and was dragged down into receivership by them on January 3, 1906. This company, the last of the three to go into receivership, was the first to come out of it. It was sold at foreclosure last May and is now reorganized as the Toledo Terminal Railroad, in whose ownership most of the railroads entering Toledo have a share. The other company is the Peoria & Pekin Terminal. This is a road operated by both steam and electricity, which has two lines of road between Peoria, Ill., and Pekin, and trackage rights over five miles of street railway in Peoria. This company was bought by the Peoria Railway Terminal, which is controlled by the Chicago, Rock Island & Pacific and the Chicago & Alton jointly. The Texas Western is a 52-mile road from Houston, Tex., to Sealy which has not been in operation for years. After having gone into receivership in 1873, it was sold in 1900 to the Houston, Brazos & Northern for $25,000 cash and a note for $125,000, whose payment was later defaulted. On October 2, 1907, it was sold for $10,000 to satisfy a judgment for $165,542, representing this note and interest. The Dayton, Lebanon & Cincinnati runs from Lebanon, Ohio, to Lebanon Junction, 30 miles, and has trackage arrangements with electric lines over which it reaches Cincinnati and Dayton. Its passenger service is operated by trolley and its freight service by steam. The Dayton, Lebanon & Cincinnati Railroad & Terminal is the successor company. The Traverse City, Leelanau & Manistique is a 30-mile branch of the Grand Rapids & Indiana, from Traverse City, Mich., to Northport, whose sale was a formality of fixing the parent company's control.

There is one more road more important than any of those included in the list of foreclosures which was advertised to be sold at foreclosure sale during the year. This is the Chicago Terminal Transfer, which owns the Grand Central Station and 84 miles of belt railroad in Chicago. Its troubles began in 1904, when the Lake Shore, the Rock Island, the New York, Chicago & St. Louis terminated their contracts with it and moved into the La Salle street station. Interest has been in default since 1905 and the foreclosure sale of the road was set for May 3, 1907, but before that time the Baltimore & Ohio, which has a valuable lease of the passenger and freight facilities of the Chicago Terminal Transfer, gained permission from the Federal court to assume the company's bonds. These bonds were paid off at par and accrued interest on the announced date of the foreclosure sale and the Baltimore & Ohio's lease of its Chicago terminals was protected. This explains the fact that these bonds for the two years that they were in default sold most of the time at a price near par. Another important foreclosure which apparently just missed getting in the year's record was that of the Pere Marquette, whose reorganization is now under way and soon to be completed by formal termination of the receivership. It is also probable that the Cincinnati, Hamilton & Dayton will before long be taken out of its receivership.

The following table shows the railroad foreclosure sales during 1907, listed in the order of the date on which the sale was made:

Foreclosures.

Name.	Mileage.	Bonds.	Stock.	Date of sale.	Selling price.
Peoria & Pekin Termnl	21	$977,000	$600,000	Feb. 9.	$600,000
Texas Western	52	.....	.....	Apr. 2.	10,000
Dayton, Leb. & Cin....	30	1,500,000	2,500,000	Apr. 16.	200,000
Traverse City, Leelanau & Manistique.....	30	300,000	500,000	Apr. 17.	339,229
Medford & Crater Lake	11	.....	200,000	May 11.	82,500
Toledo Ry. & Terminal	31	3,825,000	3,500,000	May 28.	2,000,000
Total	175	$6,602,000	$7,300,000		

FIVE PANICS

There have been five severe commercial panics in this country; four of them important and far reaching; the fifth, severe at the time but of short duration. The really first class panics occurred in 1837, 1857, 1873 and 1893; the lesser one, in 1884. The question which everybody would like to know the answer to, at the present time, is, which kind of panic and depression are we having now—the long kind or the short kind?

To begin with, let us separate ethics and economics, and keep them vigorously apart. Wickedness did not cause the 1907 panic; it never caused any panic, except as a secondary and minor cause groupable with a great many other secondary and minor causes. Every noteworthy panic that this country has had can count among its causes one constant—speculation and credit inflation—and a large number of variables. Wherever there has been heavy and continued speculation, some wickedness, some breaches of trusteeship have crept in, but the wickedness has always been rather an incident than a moving cause. The variables, not the constant, have, so to speak, brought out the symptoms of panic. Then, when the fever has run its course, the duration of the after drag has been governed principally by two things: the nature of the variables, and the soft spots which the panic has disclosed in the commercial structure. By attention to these things it is possible to see how causes and effects in previous panic years compare with the exhibit of 1907 thus far presented, and to deduce analogies, if not indications.

Without going at length into historical details that are more or less readily accessible, it should be noted that the panic of 1837 was immediately preceded by the very great success of the United States Bank. This central bank had become one of the richest institutions in the world, but its power was greatly distrusted, and the political party that elected Andrew Jackson President was strongly opposed to the renewal of the charter of the bank. Consequently, President Jackson, on constitutional grounds, refused to re-charter the bank, and a law was passed requiring the huge surplus which had been piled up after our entire war debt had been paid, to be distributed among the states. The sum of $28,101,645 was thus distributed among the states, in proportion to their population, and this distribution took place during the pinch. It was estimated that $10,000,000 was taken out of New York, and taken out at the very time when it was much needed.

This distribution act was quite generally blamed by the daily press of the time as the direct cause of disaster, but a glance at the general speculative situation which closed late in 1836, the year before the panic, casts a rather different light on the subject. In September, 1836, the United States was importing grain. The money market was growing tighter every day, all costs were rising and speculation in real estate was in progress. New York real estate, valued in 1835 at a total of $144,000,000, was valued in 1836 at $226,000,000. Meantime, a host of state banks were being opened, the most prominent of them all being the Pennsylvania State Bank, chartered by Nicholas Biddle, former President of the United States Bank, and these new banks were absorbing more and more of the scarce capital. In October, 1836, money was costing from ⅛ to ¼ per cent. per day in lots of $5,000 to $10,000, loaned on call, and during that month there were 10 or 12 failures in Wall street. Meantime, good money was getting scarcer and scarcer and bad money was becoming more and more plenty. "Wild-cat" currency, so-called, was issued not only by the state banks but by large commercial houses all over the country, and as soon as financial stringency began to be felt there were as many prices for money as there were kinds of money. People were accused of hoarding, especially in the West, but the more conservative critics of the time believed that this hoarding was over-estimated.

In March, 1837, gold was going out fast to England and much loose currency was in use in the United States. In April there were daily failures in New Orleans, where the banking facilities had been engrossed by speculators who were trying to corner the cotton crop. The *Evening Post* of April 6, 1837, referred to "the brood of incorporated banks that had treated credit like a Roman race-horse, hung it with spurs and goads and set it galloping off without a rider." Comment was also freely made to the effect that the merchant and the speculator had traded by the help of the banks on borrowed capital and had anticipated prices, and that their ruin had thrown the mechanic and the laborer out of employment. On May 4 there were crowds in Wall street and a run on the Mechanics' Bank. "New York never saw such a time." On May 5 there was panic. It was complained that southern and west-

ern money could not be sold anyhow and that the brokers "take nothing west of Albany and the banks take nothing, even for collection, on the South." The New York banks suspended specie payments on May 10 and comment was made that nothing whatever was done in country money.

Without going into the details of the gradual improvement which set in after the crash, it may be noted that dull times lasted in varying degrees of intensity for about four years. As regards stock prices; Delaware & Hudson Canal Company, which sold at 96 in the high period in the summer of 1836, was down to 87 January 4, 1837; to 73 March 24; to 69 April 6; to 64 April 27; to 53 May 4; to 50 May 8; then up again to 67 May 10, the day when specie payment was suspended; to 79 May 15; down to 75 in September; up to 78½ in November, and to 85 in June, 1838. This stock is selected as characteristic. The number of railroad stocks sold on the exchange in those days was naturally small and they all acted in a similar manner.

In the seven years ending with 1837 the country had increased its railroad mileage from 23 miles in operation to approximately 1,500 miles, and much of the new mileage was highly unprofitable at the time the crash came. The railroads had not been properly built or maintained and much of the mileage owed its existence to the great prosperity of the past few years and to the ready influx of money into all commercial opportunities, whether these were lands, mines, canals and railroads, or state banks.

1857.

Starting with the constant of speculation, we find in 1857 that there had been rapid railroad expansion, land jobbing and frauds in Congress, a high market and tight money, the railroads mostly not earning anything and everybody speculating in whatever presented itself. The new mileage built in 1856 amounted to some 3,650 miles, and the aggregate mileage built in 1857 and the six previous years exceeded that of the 10 years which followed. Again, just as in 1837, everybody was doing business on credit, and increasing expenses; with the difference, as recognized at the time, that the basis of inflation in 1837 was government specie to the extent of some 30 odd million dollars, while in 1857 there had been an enormous gold production in California and in Australia, and the basis of inflation amounted to hundreds of millions of dollars. The *Herald* complained that "our fictitious paper bubbles of all kinds have been inflated in proportion to this augmented specie basis and the crash in the same proportion brings with it its accumulated disasters. The states have created banks by the hundred and the thousand; they have issued their paper accommodations by millions; railroads and all sorts of speculative combinations have followed suit with their stocks and bonds; merchants have been enriched by credit purchases and sales upon promise to pay; speculators have become millionaires, and thus we have had a grand carnival of universal credits, universal extravagances and unbounded paper wealth." The *Herald* also said, earlier in the year, when it was preaching against the extravagance that was going to cause trouble, that "A fashionable lady cannot move abroad without a silk dress worth perhaps $50; laces, $50 more; sables, $50 more; a French hat almost $50 more, and with bracelets, watch and charms to match she moves along a capitalization of the floating funds of her husband. And this is but an item, compared with the costly contents of her boxes and bureaus at home."

In January, 1857, an investigating committee was appointed to report on the lobby corruption at Washington, which was alleged to have originated under the careless and lazy administration of President Fillmore five or six years before, and to have greatly increased under President Pierce. In February the railroads were sustaining their own stocks in the market and were borrowing short time money to pay their dividends. On February 20 the Corruption Investigation Committee reported amidst great excitement. The expulsion of Representatives Matteson, Gilbert and Edwards, of New York, and Welch, of Connecticut, was demanded, and it was testified that there were 20 or 30 members of the house associated and pledged to each other not to vote for any law or resolution granting lands or money unless they were paid for it. The *New York Herald* observed that Horace Greeley had been bought and sold to the service of the Des Moines Improvement Company at the low figure of $1,000—"the average price of a common Virginia nigger." In March the newspapers said drearily that railroad prosperity had seen its best days in the United States, that competitive construction, depreciation and destruction accounts had not as yet been properly considered in the financial movements of the railroad companies; that the country had just arrived in the point of the history of the railroads where it could not longer be overlooked that large reservations must be annually made to keep the property in working order before dividends could be paid out of net earnings. Meanwhile, President Buchanan was inaugurated and better feeling prevailed for a time, but imports were much in excess of exports, and when the crops came along, cotton was very backward. Grain was abundant, but there was no foreign market because of the good harvest all through Europe. The market for American railroad securities abroad had been spoiled by common understanding of the fact that a great many dividends were being paid which had not been earned. The output of California gold was smaller than in 1856, yet speculation, expansion of credits and extravagance went on unchecked.

On August 24, 1857, the Ohio Life & Trust Company suspended. The concern had been a large borrower, and it was subsequently developed that a trusted eastern agent had been shamefully misusing its funds and that the failure was going to be a very bad one. On September 21 the Mechanics' Bank, and Beebee & Company, specie brokers, suspended. There were runs on the Hanover Bank, the Metropolitan Bank and the Bank of Commerce, and runs and bank suspensions in Buffalo, Paterson, Detroit, etc. The Erie, the Michigan Southern, the Illinois Central, the Cleveland & Toledo, the New York Central and the Reading were all in a more or less insolvent condition. The Illinois Central assessed its stock $10 a share but was not able to stem the tide even with this assistance.

There was a slight upward turn of the stock market in September, 1857, but it did not have special significance. In the week ending Oct. 1 there were 100 commercial failures, and banks all over the country were in difficulties. On Oct. 9 the Erie and the Michigan Central were unable to meet the interest charges on their floating debts; on Oct. 10 the Illinois Central suspended, for the same reason. Up to Oct. 26, beginning with the suspension of the Ohio Life & Trust Co., there had been some 1,500 failures of merchants and traders, and about the same number of suspensions of banks and railroads, yet contemporary comment pointed out that the country as a whole had never been richer.

Better feeling in 1857 began in November; there was a steady influx of gold from Europe and from California, and in October and November together, over 11 millions of specie arrived in New York. The banks resumed specie payments in December, and had, in New York, double their usual reserve. Prospects were then considered bright, and in January, 1858, money was abundant in Wall street, although commercial money was extremely tight. In March, 1858, very dull business was reported everywhere except in Wall street, where transactions were brisk, but things were looking better ahead, and after a large number of commercial failures throughout the spring, prosperity began to reappear. The exact duration of the drag after the 1857 panic is rather hard to estimate because of the interference of the Civil War period, but it may be set down roughly at two years, during which industry, though by no means paralyzed, was clearly below normal.

1873.

The next first-class panic came in the year 1873 and it is curious to see how closely the speculative features of 1837 and 1857 were repeated. Again there were heavy railroad speculations. Following 1856, the year before the previous panic, the annual increase in railroad mileage did not exceed 2,500 miles until 1868, when almost 3,000 miles were built. In 1869 4,615 miles were built; in 1870, 6,078; in 1871, 7,379, and in 1872, 5,878. After the '73 panic, 5,000 miles of new road were not built in any single year again until 1880, but the over-extension in 1873 was very great; unproductive lines encumbered almost every system, and people began to realize that it would be a long time before some of these lines were worth anything. Extravagant and extended business were much in evidence in 1873, just as they had been in 1857 and in 1837. There was also inflated currency, much watering of stock and reckless management of trust companies and savings banks. The Chicago fire of 1871 was a very important contributory cause. The absolute loss to the country resulting from the Chicago fire is estimated at $150,000,000; a sum much larger in those days than it is now. Another moving cause of the panic, though a subsidiary one, was the passage of the severe Granger laws in the Northwest, and the rate wars between the railroads themselves, which did not give much hope of amicable settlement. The subsequent truce between the trunk lines dated from the Saratoga conference, in 1874, although there was much trouble after this prior to the formation of the Southern Railway and Steamship Association, in 1875, and of other kindred organ-

izations. The operations of Gould, Fiske, Drew, Vanderbilt and Keep were fresh in everybody's mind, although the most notable corners in Erie, Chicago & North-Western and Milwaukee & St. Paul occurred in 1868. Manipulation of money and the attempt of Jay Gould to corner the gold market in 1869 were also remembered; consequently it took only the suspension of the Warehouse & Security Company, which had loaned money to a construction company to aid in building the Missouri, Kansas & Texas, to precipitate the 1873 panic.

In July, 1873, there was abundant money to be had at 3 and 4 per cent., and the stock market was strong. Prime discounts were at the rate of 5½ to 7 per cent. In August the government surplus was very low, trade was declining and there was a decreasing bank reserve in New York. Call money rose about 1 per cent. in the second week of August and advanced to 6 per cent. on August 19, though it slacked off somewhat in the next few days. Exports from Jan. 1 to Aug. 26 amounted to $185,000,000 in 1873, as against $147,000,000 in 1872; while imports had amounted to $275,000,000 in 1873, as against $296,000,000 for the same period in 1872. On Aug. 31 the contemporary press regarded the prospects as being very good, but early in September call money went up to 7 per cent. and, following a rather sharp speculation in Wall street, the suspensions of the New York Warehouse & Security Company and of Sheppard Gandy and Francis Skiddy were announced. On Sept. 9, prime discounts cost from 10 to 12 per cent. On Sept. 15, the Eclectic Mutual Life Insurance Company failed, and on Sept. 17 Jay Cooke & Company went under, involving the Northern Pacific and the Western Union directly, and a host of concerns and individuals indirectly. By the close of the exchange on the following day, 17 well-known stock exchange houses and a number of smaller ones had failed. The stock exchange was closed on Sept. 22, and there were runs on savings banks. So far as the solvency of banks was concerned, confidence was restored in 1873 very soon. President Grant courageously refused to sign a bill providing for a treasury loan and the feeling at once began to be better, although trade everywhere became greatly depressed and there was no real and substantial recovery until about 1878.

1884.

Measured by the retardation of business and the ensuing drag, the 1884 panic cannot be called a first-class one, yet this panic is in some respects so closely analogous to the conditions of 1907 that the principal facts of it should be recorded. Unlike 1907, there had been a period of great railroad construction; there had also been heavy inflation of securities. Along with this came the exposure of great financial frauds. On May 5 the Marine National Bank suspended in consequence of the speculations of its President, J. D. Fish, with the house of Grant & Ward, and Grant & Ward themselves failed May 14. The defalcation of John C. Eno, President of the Second National Bank, involving some $4,000,000, had occurred just before; then the Erie defaulted, as usual. But it is incorrect to describe 1884 as a year of real commercial crisis. The prime effects of the panic had disappeared by July and partial confidence was restored, while in June, 1885, there was substantial recovery upon the negotiations for a cessation of the war between the New York Central and the West Shore. The lease of the West Shore was effected in August, 1885, and prices advanced. The panic of 1884 has been described as an incident following the long drag-down of stock values from the culminating point in July, 1881, with the crisis precipitated by the events which have been mentioned, and in this drag-down it is closely comparable with 1907.

1893.

The panic of 1893 is so fresh in everybody's mind that only brief reference to it need be made. The silver bullion purchase act of 1890 depleted the gold reserve of the treasury in the Harrison administration; then came speculation, the inevitable precursor of panic. The business done in 1892 was very great, but depression was felt at the close of the year and people were afraid that the redemption of the 1890 treasury notes in gold would be suspended. Poor crops were also anticipated. The National Cordage Company suspended in May, five months after it had declared a stock dividend of 100 per cent., and the value of silver was unsettled by the June 27 cable announcing that the Indian government had suspended the public coinage of silver. Meanwhile bank reserves were fluctuating and then falling. Clearing house certificates were issued on June 21; bank reserves began to recover in August, following heavy imports of gold, while at the close of the year, in spite of the fact that it was the crop moving season, there was an abundance of money and rates for it were very low. The total bank clearings of the United States in 1893 were 54 billion dollars, as against 62 billion dollars in 1892. The total number of commercial failures in the country was placed at $114,000,000 in 1892 and at $347,000,000 in 1893, while imports of merchandise fell off from $841,000,000 in 1892 to $777,000,000 in 1893; exports of merchandise from $938,000,000 to $876,000,000, and the gross earnings of 124 railroads from $564,000,000 to $552,000,000. The wheat crop was very small, the corn crop not as good as that of 1892, pig iron production was about one-fifth less in 1893 than in 1892 and immigration to the country fell off from 543,000 to 489,000.* Meantime, railroad suspensions and receiverships had been continuous, and at the close of the year 25,375 miles of road were in receivers' hands; a total equal to about one-seventh of the entire railroad mileage in the country.

As is well-known, the drag after the 1893 panic lasted about four years. The part which speculation played in the panic is shown by the railroad receiverships. The record for new construction was made in 1887, when 12,876 miles were built, while in the next five years the additions to the mileage of the country totaled over 25,000 miles and equalled in amount all the mileage built between 1893 and 1903. This was the special form which the 1893 speculation took, and when the workings of the silver purchase act had sufficed to bring on a state of extreme fear, the railroads were the weak spot and they suffered, involving much of the general prosperity of the country with them.

1907.

In view of the facts outlined above it is extremely interesting to see if it is possible to match off events in such a way that a reasonable basis for a prediction of the length of the drag to follow this year's panic may be ascertained. Accepting the element of speculation as the constant, as has been mentioned before, its outworkings can, of course, be traced in the extraordinary stock exchange prices of the closing months of 1906; in the boom in mining stocks and, to a lesser extent, in suburban realty. But the speculation in real estate has been on a far less dangerous basis than in the other panics, excluding 1903, when it was not particularly apparent. In 1857, for example, town lots were being sold in localities all over the country where the towns have not yet come, after a lapse of 50 years, and suburban property located, say a mile from the center of New Haven, Conn., or even of Des Moines, Iowa, could be readily sold in New York City to purchasers who never saw it and never expected to see it, but relied on their profits for a quick turn to somebody else who had never seen it. This same feature had characterized 1837, and, in less degree, 1873; it was almost wholly absent in 1893 and in 1907. In 1837, direct loss of confidence was caused by distribution of the surplus and by the wild-cat currency; in 1857, by land jobbing, bad crop markets and the general feeling that railroad properties had seen their best days and that investments in them were subject to heavy depreciation. In 1873 there was a bad government surplus, paper money with gold at a high premium, the manipulations of Jay Gould and his clique, and the Chicago fire; in 1893, the silver purchase act and over-extension of railroads.

Now, we have had no over-extension of railroads in the last five years. On the contrary, the excess of traffic over facilities has occasioned great hardship, and it may be said, broadly, that there was no unprofitable mileage in the country whatever in 1906. Bad money, the fear of which was so potent a factor in 1837 and in 1893, and to a greater or less degree in all the other panics, has not been in evidence this year at all; our defective currency system may at times be an encumbrance upon prosperity and a drag upon recovery, but it is certainly not a moving cause of panic.

The speculation which preceded the 1907 panic covered a very large range of industries, but, as we see it, the really important difference between the speculation of 1907 and that of the other notable panics in our history is that the money of speculators has been spent in productive instead of non-productive enterprises. The difference in the railroad investments of the period prior to 1907 and the period prior to 1893 is that in the former period railroads were built where the demand for them was not real, while in the latter period, shares changed hands at higher and higher prices, but the new securities put out in this golden time were devoted rather to consolidating and bettering existing lines and recognized trade routes, than to exploring unknown territory. The difference in the outcome must necessarily be very great.

The defective trust company law in New York, which allowed

*We are indebted to the *Commercial and Financial Chronicle* for these figures.

these great institutions to indulge freely in the speculative fever and to so involve their affairs that their assets were not liquid at time of need, was doubtless an important moving cause of the panic, but it seems to us that the most important cause of all—always presupposing a general situation made unsound by a long speculative period—was the action of the government and particularly of the President of the United States. We are well aware that in each previous panic the President in office at the time has been attacked and subsequently exonerated; but there has been no previous instance where the President has so mixed with his duties as chief executive, his own personal ambitions and animosities, and gone on creating bugaboos and shrieking at them under conditions of intense publicity until he has succeeded in creating a condition of childish terror throughout the length and breadth of the country. Moreover, this sort of political success spreads, and when a self-seeking judge imposes a $29,000,000 fine on a technicality, Europe may well be pardoned for declining to continue her investment in American securities, and the American investor may feel doubtful of all his holdings. The question of wickedness is in no wise involved. Our courts have been neither more nor less efficient in administering the laws of the land than they were in previous times. The average of railroad and industrial management has not only been no lower than it used to be, in these years that President Roosevelt has known how to make political capital out of it; it has been infinitely higher.

Assuming that speculation was the fundamental cause and an unstable, socialist President the precipitating cause of the 1907 panic, the situation gains strength from the fact that the first of these causes is already spent, without disclosure of any important area of weakness, while the second will be remedied next fall. With sound currency and no important overproduction, the elements of a long drag appear to be lacking.

CONTRIBUTIONS

Accident Record—Correction.

An officer of the Chesapeake & Ohio informs us that the report of a derailment on that company's line, published in the *Railroad Gazette* of November 29, page 642, with a notation of one person killed, is erroneous; no persons were killed in the accident and none seriously injured.

Curve and Switch Tables.

Chicago, Dec. 16, 1907.

To the Editor of the Railroad Gazette:

In looking over the curve and switch tables published in your issue of November 8, which only recently came to my notice, I observe what appear to be two errors in the explanation of the tables as printed. The frog distance for crossovers between parallel tracks is given as c c — 2 g n, where c c is the distance center to center of tracks, n the number of frog and g the gage. This is obviously a misprint, or an oversight by the author of the tables. An approximate formula for this frog distance would be n x c c — 2 g n = n (c c — 2 g).

In the explanation of the combined use of Tables I. and II., the example states that it is in explanation of a turnout from the inside of a curve, but the example covers a turnout from the outside of the curve, the word "inside" being used for "outside" as will be noted a little further along in the paragraph where it states that the location of the turnout from the inside of a curve would be obtained by subtracting the quantities before added.

S. S. Roberts,
Assistant Engineer, Illinois Central.

Reforming Careless Trainmen.

Montreal, Dec. 2, 1907.

To the Editor of the Railroad Gazette:

In your issue of October 11 referring to the action of the Canadian Government in prosecuting conductors and enginemen in connection with railroad wrecks, you use the word "collisions." This does not cover the ground; neither does the word accident, so I prefer the word wreck, which means a total loss.

It seems to me you confuse the issue. You imply that the Canadian Government is likely to punish too severely men who are guilty of nothing more than errors of judgment. Would it not be fair to wait until such a thing has happened? As yet it has not.

In the judgments handed down in such cases as have so far been tried, there is nothing to find fault with, but they [the judges] do show a knowledge of the subject in hand, and a mastery of detail that would, I admit, have a tendency to get onto the nerves of reckless and careless trainmen.

Our Government has not gone too far. It has shown a perfect willingness to "go higher up" at any time, and punish the guilty whenever found. I do not agree with you that abundant experience has shown the futility of everything but careful instruction to make men careful and trustworthy. You forget that careful instruction has been tried for years, while prompt and effective prosecution by law has not. I have nothing to say against careful instruction. That will, and must go on as it always has, but there are men who cannot be made careful and trustworthy by this means, and it is high time that other and more drastic means be employed. Take the case of the conductor who had years of careful instruction, and was paid extra money by the railroad company to perform certain work and who deliberately lay down and went to sleep, thereby causing loss of life and heavy money loss to his company. Can anyone find fault with the judgment in his case?

Or the engineman who is paid much more money than he is worth, who is intrusted with an important train on a piece of road with which he is perfectly familiar, and who runs that train at a rate of speed that even people on the train, and men beside the track know is far beyond the limits of safety, (see evidence in recent case), and finally wrecks the train with loss of life. Is he anything else than criminal?

These are cases that have come to trial and are fresh in the minds of the public; but think of the many cases of which the public know nothing and where the railroad company are the only sufferers. Here is one: On a certain railroad there is a long grade where trains should be handled with judgment and care. The almost constant use of the brakes causes heating of shoes and wheels. The railroad officials fully recognize this and have standing orders that trainmen shall examine their train at water station at top of hill, and come to a full stop and examine again at water station at foot of grade. As I happen to know, the officials do not hope to have this examination made with any degree of thoroughness, but they hope by having the train brought to a full stop for a time to insure a decrease of speed, and at least give shoes and wheels time to cool. Now when an engineman runs past this point with a heavy freight train, at 60 miles an hour, so that people get out of bed and make bets as to how far he will go before he ditches his train, and he does ditch it inside of one mile, destroying $20,000 worth of cars without counting other loss, and then comes in with his crew and states he was running "20 miles an hour and struck a spread rail," what are you going to do with him? Condole with him for his error of judgment, and protect him from a Government that is likely to punish? Unfortunately the Government does not take up such cases, and the railroad company has no redress whatever. The discharging of the criminal from the employ is small satisfaction. I have no doubt "alarm and resentment" is felt by such men, but we want considerable more "alarm" and I think all decent people will feel that we can stand the "resentment."

I hold no brief for the soulless railroad company, but the world gains nothing by maudlin sentiment that would make a hero of the man who by criminal carelessness destroys property and lives.

For the past few days we have been reading the harrowing details of a wreck on one of our Canadian roads; and the facts at hand point to still one more case of this kind, where two men intrusted with moving a light engine over a division run on the time of an important passenger train until they meet her, killing several people, injuring many more, and destroying two engines and three cars with mail, baggage, etc. It is true these men were killed, but does that help? And we must not lose sight of the fact that the men responsible for these things are the men who by organization have the railroads by the throat, and are and have been for some time bleeding them of their last dollar.

There is no danger that the good and careful man will suffer at the hands of the Government prosecutor, and as a matter of fact he is just as much in need of protection as the public and the railroad company, for one sad feature of these wrecks is that the good man is often the greatest sufferer. It is most unfair that the railroads and their officers should bear the onus in these troubles. The superficial thinker may say at once, why should the railroads have such men in their employ; but you might as well ask why a bank will have in its employ a cashier who will run away with its funds.

It is a strange travesty that prosperity brings out the worst in men. You can do nothing with the man who cares nothing for his job. Twenty-five years ago you would find in the railroad service the reckless man, the liar, the drunkard and the thief. In fact, to be a "railroad man" was equivalent to being a little below the general standard, but that condition slowly passed away until the reverse was the case. But to-day we find that the wonderful and widespread prosperity has brought it back. It will disappear again more quickly than it did before, and while the public and the decent railroad man may suffer, as they have, it is after all the

railroad company that suffers most, and it is both right and proper that the law of the land should step in and protect all three.

E. J. M.

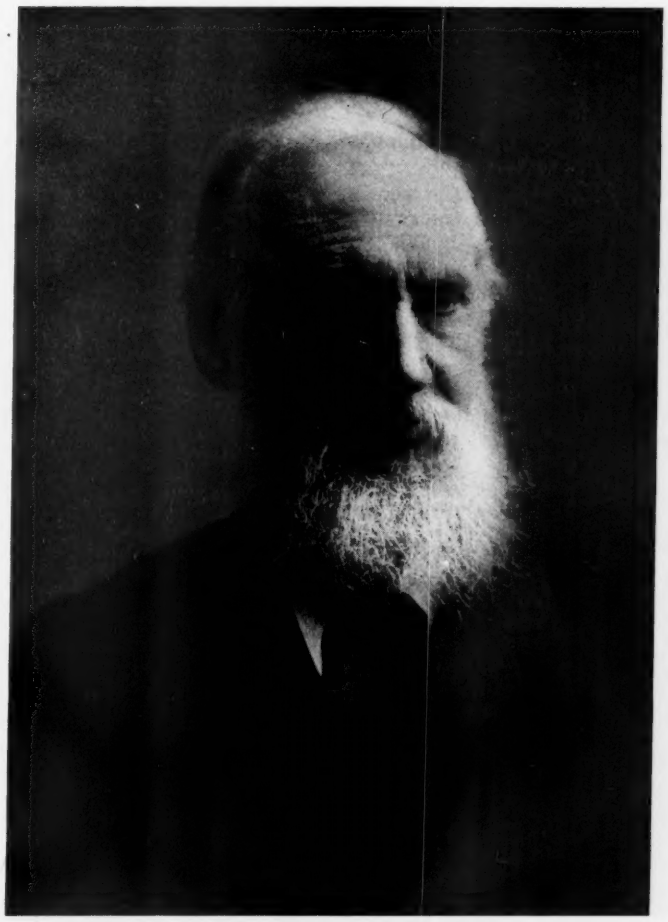
Our correspondent presents some fallacious arguments, which the cool-headed reader will readily answer without our assistance; but we print the letter because it voices grievances which we often hear from the mouths of railroad officers. His chief point against our note of October 11 is that we advocate education instead of imprisonment as a cure for carelessness on the part of enginemen; and he claims that punishment under criminal law is the true preventive of "wrecks." But if he admits that death is a punishment he must admit that fear of the penalty does not deter men from running trains to destruction, for surely enginemen know that when they neglect the rules of safety they imperil their own lives. Our correspondent will also agree that to prevent the "wrecks" we must take systematic measures to prevent lesser errors; yet he himself cites a case which the Government does not take up. No; the criminal law, however just its provisions, cannot be made to touch a tithe of the causes of railroad "wrecks." Our correspondent calls for drastic measures because "careful instruction" has been tried and has failed. The trouble is that usually it has been tried only in a desultory way. The wrecks cited in the letter seem to have been caused mostly by men who were reckless, as distinguished from careless. Moral delinquency is, indeed, often incurable, but men of that class can be weeded out. Adequate discipline exposes them. The railroad officer who keeps such men in the service because prosperity has overburdened him with traffic, deliberately takes upon his own shoulders the responsibility for the safety of his trains.—EDITOR.

Courts on Ticket Scalping.

The Federal Supreme Court has at last confirmed the long line of decisions against ticket scalping by affirming the injunction issued by the Supreme Court of Louisiana against the resale of limited tickets. It is now nearly 30 years since legislation was secured in Pennsylvania, followed by New Jersey, against the resale of railroad tickets. In 1897 legislation was secured in New York, but the statute was declared unconstitutional by the Court of Appeals in 1898, and the Everett act met the same fate in 1901. The New York courts, though with dissenting opinions, have held that a railroad ticket was property and that, once bought, its sale could not be interfered with. The Illinois Supreme Court reached a like conclusion, and it is the general drift of common law that a common carrier cannot limit contracts for transportation; but the Pennsylvania courts have held a different doctrine, as have those of Texas and other states; and the Federal courts have for years tended to regard it lawful to prohibit the resale of special rate, excursion or limited railroad ticket.

It is a settled doctrine of the Federal Courts that a contract for transportation can be limited to the original holder. Judge Wood, of the United States Circuit Court, confirmed this. Injunctions have been issued by the state courts, and one of them was sought in Louisiana. The lower court refused this summary redress. The Supreme Court of Louisiana granted the injunction. The case was carried to Washington and the Federal Supreme Court holds that "a non-transferable reduced rate ticket" can be protected by an injunction from resale, as the ownership gained by the purchase is only "limited and qualified" and the roads issuing "retain a subordinate interest in the ticket amounting to a right of property therein which a court of equity would protect." —*Philadelphia Press.*

The Sigl Locomotive Works in Austria took a number of contracts to supply foreign railroads last year, there being not enough Austrian orders to keep the works going. These foreign orders were executed at a considerable loss, and not only could no dividend be paid, but the face of the shares is to be reduced 10 per cent.



Lord Kelvin.

Lord Kelvin.

William Thomson, First Lord Kelvin, died in London on December 17 after several weeks illness. Lord Kelvin was considered the foremost physicist in Great Britain and probably in the world. He was identified with the development of many theories now generally accepted. He took an important part in building up the doctrine of the conservation of energy and the theory of the dissipation of energy is almost entirely due to him. His most important book is his "Treatise on Natural Philosophy," written with Prof. Tait. His other works include papers on mathematics, thermodynamics, magnetism and electrostatics. His greatest contributions to the application of science were in the field of electricity. He was electrician for the company which made the unsuccessful attempt to lay the Atlantic cable in 1857, and for the company which succeeded in laying it in 1866. He acted in similar capacity for several other lines laid between 1869 and 1879. He designed one of the first practicable alternating current dynamos and was chairman of the first advisory board which considered the development of electric power from Niagara Falls. Among his other inventions of immediate practical value are: the present form of the mariners' compass, the siphon recorder and other apparatus used with most submarine cables, and many instruments for measuring electric current.

He was born at Belfast, Ireland, on June 26, 1824, his father being Professor of Mathematics at Glasgow University. He was educated there and at Cambridge, and when 22 years old was made Professor of Natural Philosophy at Glasgow University. This chair he filled until 1899. He was knighted in 1866 and in 1892 was made Baron Kelvin of Netherall, Largs, Ayrshire. He held many other titles and honors, conferred on him by societies and universities in Europe and the United States. Lord Kelvin was married twice, but leaves no heir.

Sleeping Car Berths in Wisconsin.

The Supreme Court of Wisconsin has declared unconstitutional the act of the 1907 Legislature which assumed to give the occupant of a lower berth in a sleeping car the right to say whether the unoccupied upper berth shall be open or closed. The court declares that the act is an unwarranted interference with the right of dominion over property by the owner thereof, and an unlawful appropriation of property, not in the interests of the general public but for the convenience of a few. It is suggested that the Legislature could compel a railroad to give a passenger this right if he paid reasonably for it.

The main opinion was written by Justice R. D. Marshall, and Justice William H. Timlin filed a supplementary opinion, concurring in the result, but setting forth that he believes that the Legislature has a right to regulate the operation of sleeping cars.

The syllabus says: Police regulations which are reasonable are not inhibited by the constitution though invading its letter, since the exercise of the police power is so essential to the public welfare that it is presumed that such exercise within reasonable limits was not intended to be prohibited, but, on the contrary, guaranteed by the general declared purposes of civil government and the manifest purpose of the constitution.

It is a judicial function to determine the proper subjects for police regulations and a legislative function to determine, primarily, the expediency of regulation and the character thereof subject to judicial supervision to the extent of determining, in cases as they arise, whether the boundaries of reason have been so clearly exceeded as to violate some constitutional prohibition, express or implied; the judgment of the Legislature being controlling unless it appears beyond reasonable controversy that the interference is unreasonable.

The doctrine that the police power is a law of necessity may well be said to furnish the key to what is within and what is

without the boundaries of such power; not that a police regulation to be legitimate must be an absolute essential to the public welfare, but that the exigency to be met must so concern such welfare as to suggest reasonable necessity for a legislative remedy, the legislature to be the primary judge and the supreme judge as well except as to interference so unreasonable as to be excessive beyond reasonable controversy.

* * * Is the restraint or requirement in proportion to the danger? Is it possible to secure the object sought without impairing essential rights and principles? * * * A legislative declaration respecting the character of a law, as that its purposes is to promote public health, is not absolutely binding on the courts. It is their function to determine the real intent of the law and if its ostensible is not the real purpose, to give effect to the constitution by condemning the enactment.

A law providing that the upper berth in a sleeping car, when unoccupied, at the option of the occupant of the lower berth, be closed, is not for the promotion of the public health and comfort in that the option is given in each instance where the regulation is applicable to say whether it shall operate or not, manifestly suggesting that it is for private rather than for public interests.

The penalty for violating the law was imprisonment for six months or a fine of $100, or both. The Pullman Company instructed its porters to disobey the law. Stone, a passenger, filed a formal complaint with the District-Attorney of Brown county, at Green Bay, against a porter on the Northwestern road; the porter was arrested and convicted. The Pullman Company appealed to the Supreme Court, having backed the porter at all steps in the court procedure.

Vandalia Track Elevation and Improvement Work at Indianapolis.

In September, 1905, the city of Indianapolis, Ind., passed an ordinance requiring the elevation of all steam railroad tracks west of the Union Station as far as West street. Although the lineal distance covered by the ordinance was less than half a mile, some serious and puzzling problems were presented. The roads chiefly concerned were the Vandalia, the Big Four (C., C., C. & St. L.), and the Indianapolis Southern—the Illinois Central's recently completed line into Indianapolis, described in the *Railroad Gazette* of March 15, 1907. As mentioned in that article, the original construction of this line was made to conform to the elevation ordinance requirements and it is therefore built on an elevated steel structure for about three-quarters of a mile.

Of the other roads, the Vandalia had the heavier work to do. The accompanying map, Fig. 1, shows the district between Union Station and White river, with the lines as at present revised. The most serious problem of the Vandalia was to take care of its Vincennes division line to the best advantage. As the map shows, this line comes in from the southwest parallel to Kentucky avenue. There are two tracks, which for the last few hundred feet of their length occupy the west side of this street. Elevation of this portion of the line would have required the construction of a double-track steel viaduct and the raising of the various industry tracks connecting therewith, this being the solution offered by the city for this portion of the work. But the excessive cost of the work and the remonstrances of the owners of the industries affected caused the abandonment of the idea in favor of the one adopted. This was the construction of what is known as Eagle creek connection, a cut-off from the Vincennes division to the St. Louis division, west of the city, as shown in Fig. 2. The Vincennes division traffic is thus diverted to the St. Louis division outside the city. There was no necessity therefore for elevating the Vincennes division tracks, which, however, will be used as switching tracks to the industries adjacent thereto.

Just after crossing White river the old single-track main line of the St. Louis division passed through the city freight yard as shown in Fig. 1. To avoid elevating this yard it was decided to relocate the line to pass around the north side of it, crossing White river about 210 ft. north of the old bridge. The new line, which is double track, continues across the bottom west of the river and joins the old line near the Belt (Indianapolis Union Ry.) crossing about 1½ miles west of the station. The Vandalia already owned most of the necessary right-of-way for the new location. The additional land needed west of the river was secured by exchanges with the Big Four.

The map also shows the profile of both the old and new lines. In the city, on the elevation work, the greatest raise above the former grade is 10½ ft., which is at the Kentucky avenue crossing. From this point there is a 1 per cent. temporary run-off toward the station, and on the west, following 500 ft. of 0.4 per cent. down grade, there is a 0.25 down grade across the river and Parry avenue. From Parry avenue the line runs down to a grade crossing with the Belt, which is about 4,400 ft. west of the river.

When the Kentucky avenue crossing was begun the old main track of the Vandalia had to be abandoned and arrangements were made to run into the station over the Big Four tracks. The new

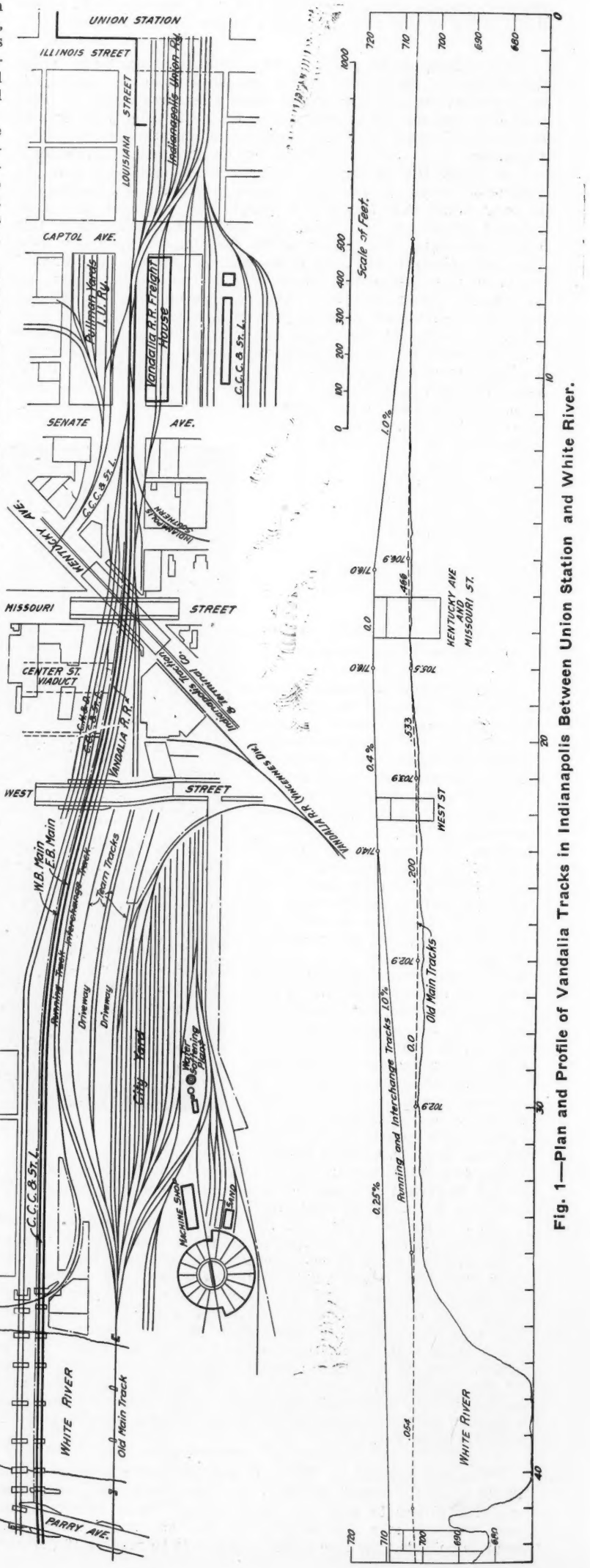


Fig. 1—Plan and Profile of Vandalia Tracks in Indianapolis Between Union Station and White River.

line west of the river had been completed and a temporary connection with the Big Four was therefore put in west of Parry avenue. As soon as the Vandalia was ready to use its new tracks, the arrangement was reversed in order to permit the Big Four to build its portion of the West street and Kentucky avenue crossings and raise its tracks to the new grade. The Big Four did not disturb its White river crossing and the temporary connection with the Vandalia tracks was therefore put in about 500 ft. east of the river. The Cincinnati, Hamilton & Dayton's Springfield, Ill., line enters Indianapolis over this division of the Big Four and the trains of

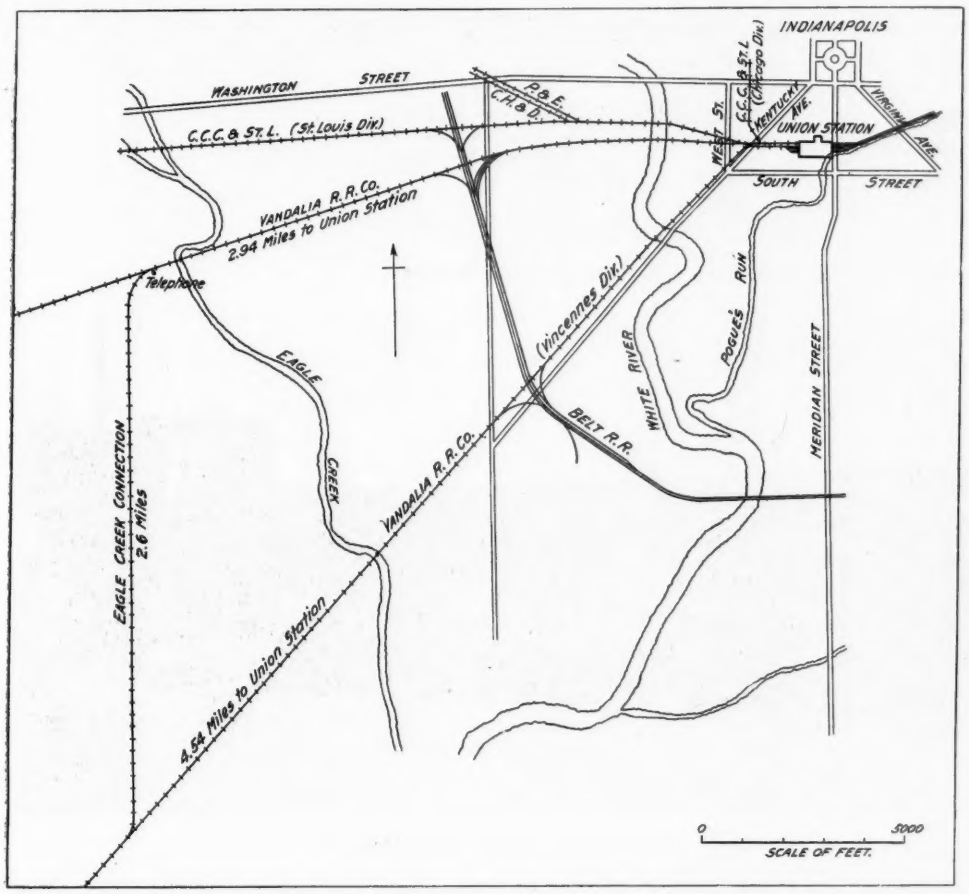


Fig. 2—Map of Vincennes Division Connection; Vandalia Railroad.

the two will continue to use the Vandalia tracks until the elevation work of the Big Four is completed enough for resumption of traffic on its own lines. This will probably be about the first of the year.

The most important single feature of the work is the White river bridge, in conjunction with which is the Parry avenue crossing immediately west. The two were built at the same time, under one contract. The river crossing is a deck plate girder structure on concrete masonry, the superstructure being independent for each track, except for sway bracing. The Parry avenue crossing is similar to the other street crossings, which will be referred to in detail later. White river bridge is 545 ft. long, made up of seven spans as follows, beginning at the east end: One 43-ft. 6-in. span, two 81-ft. spans, two 103-ft. 3-in. spans, one 81-ft. span and one 52-ft. span. The dimensions given are center to center of piers. Work was begun on the substructure early in April, 1906, and the bridge was finished late in December of that year. The masonry was to have been done in three months, but numerous unexpected obstacles delayed progress on the foundations. All masonry rests on piles except the east abutment, the piles being driven to gravel in all cases. In putting down the foundations easy digging was impeded by the occurrence of large boulders, old trees, etc. United States interlocking steel piling was used on three of the piers and wooden sheathing on the rest, the wood sheathing being 6-in. x 8-in. yellow pine in one instance. Better progress would have been made had the steel piling been used throughout. This and most of the wooden sheathing was driven with a steam hammer. A drop hammer was used for the steel piling and in several cases the piles were driven completely through old logs. The bottoms of these piles, which were 12-in. wide, weighing 35 lbs. to the foot, were badly battered in several instances where large boulders were encountered. The steel piling made almost a water-tight cofferdam, but proved exceedingly hard to pull, requiring 90 tons to start some of the sections, and in some cases four or five sections would come up together.

The total weight of the superstructure of the bridge is 1,608,411 lbs. The contractor for the substructure was the Essex Construction Company, and for the superstructure the Pennsylvania Steel Company. A view of the two bridges—White river and Parry avenue—is shown in Fig. 3, the truss bridge back of the river crossing being that of the Big Four.

The most important subway is at Kentucky avenue. It will be observed from the map (Fig. 1) that this occurs at the intersection of Kentucky avenue with Missouri street, Kentucky avenue passing under the tracks at a skew of about 45 deg. A single structure serves the two elevating roads and also carries a switching track for the C., H. & D., making eight tracks in all. It is a solid ballasted floor bridge built up of columns, cross-girders and troughs. For Kentucky avenue the distance between abutments is 85 ft., and for Missouri street, 60 ft. Details of the concreting of the Vandalia's portion of the floor are shown in Fig. 4. The troughs are filled with 1:3:6 gravel concrete carried 3½ in. above the tops of the troughs. One inch below the surface is embedded electrically welded wire cloth of 3-in. x 8-in. mesh. Over this is a five-ply coat of felt and pitch applied according to the Barrett specifications. A layer of soft building brick on 1 in. of sand protects the waterproofing and over this the ballast is laid. The details show how the concrete

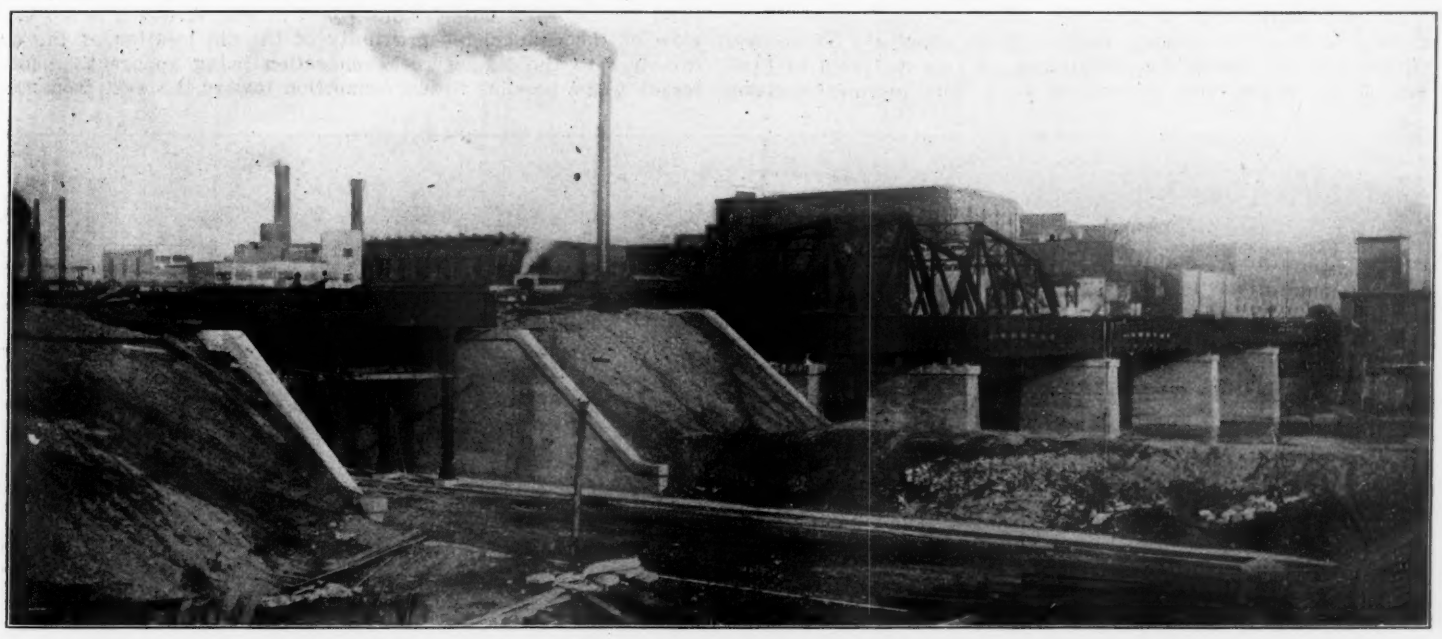


Fig. 3—Parry Avenue and White River Bridges, Showing Big Four Bridge in Background.

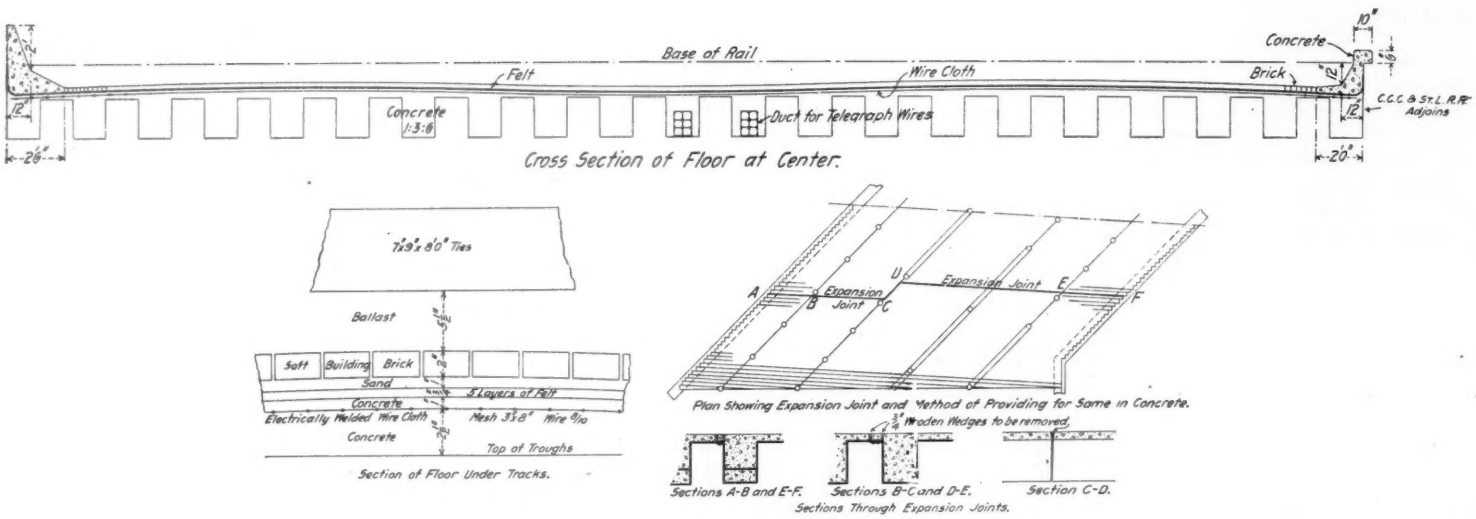


Fig. 4—Details of Concrete Floor; Kentucky Avenue Bridge.

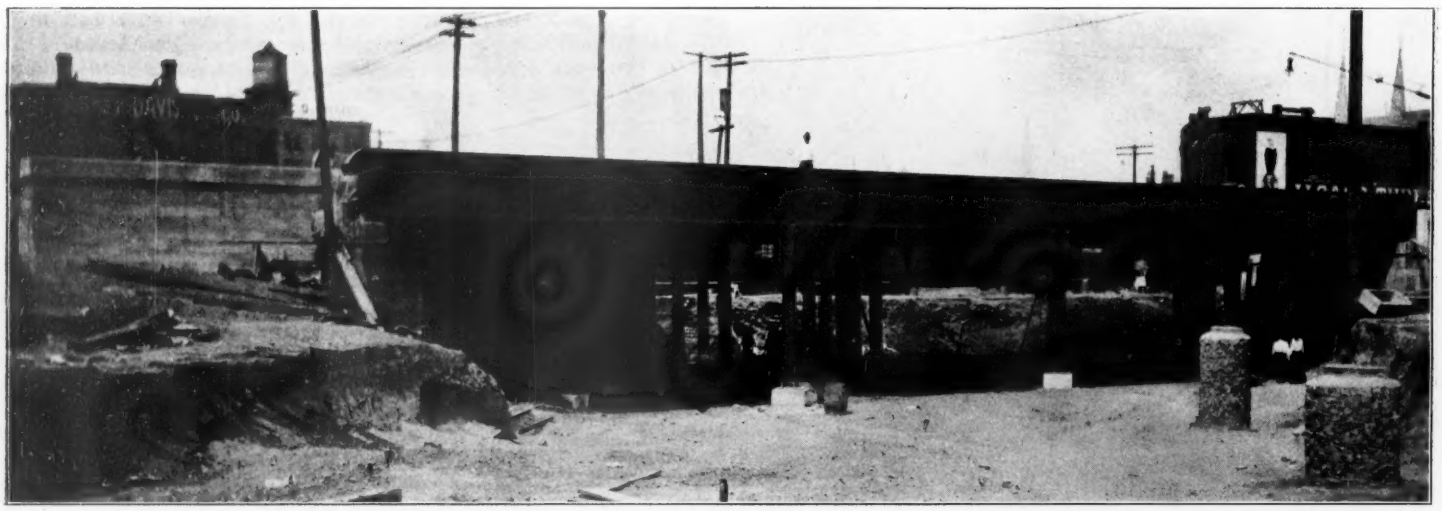


Fig. 5—Kentucky Avenue Bridge; Indianapolis Track Elevation.

is carried up to the tops of the fascia girders. They also show the expansion joint placed longitudinally of the bridge and the method used in providing for same in the concrete. All telegraph wires are being put underground on the elevation work from the passenger station across Parry avenue. Two six-hole conduits are used, which are placed one above the other in the fill, and side by side on the bridges. Their position in two of the troughs is shown in the cross-section of Kentucky avenue bridge in Fig. 4. A manhole, for access to the wires, is placed at each end of each bridge. A photographic view of Kentucky avenue bridge is shown in Fig. 5.

In conjunction with the work in the city, and the changes necessitated thereby, a large amount of improvement work is under way immediately west of the city, including grade revision and second track work from the west end of the terminal freight yard, just west of the Belt crossing, to Ben Davis, about 6½ miles west of Union Station. As already mentioned, and as indicated in Figs. 2 and 6, the Eagle creek connection from the Vincennes division joins the St. Louis division about three miles west of Union Station. This line is continued as a third track across Eagle creek and into the terminal yard already referred to, about half a mile east of the junction. The old crossing of Eagle creek was a two-span single-track lattice girder bridge. This was replaced by the three-arch reinforced concrete bridge, shown in Fig. 7, the arches being 55 ft. clear span.

The construction of the Eagle creek connection also necessitated a considerable change in the grade and alinement of the electric interurban line paralleling the Vandalia—the Terre Haute, Indianapolis & Eastern. To avoid a grade crossing, the traction line was carried overhead by the railroad company. In order to do this it had to be swung to the south, as shown in Fig. 6, in order to have room for the fill. This is shown best in Fig. 8, which is a general view of the change, the proximity of the old location of the traction line to the Eagle creek connection being apparent. Another reason was a possible future connection toward the west from Eagle

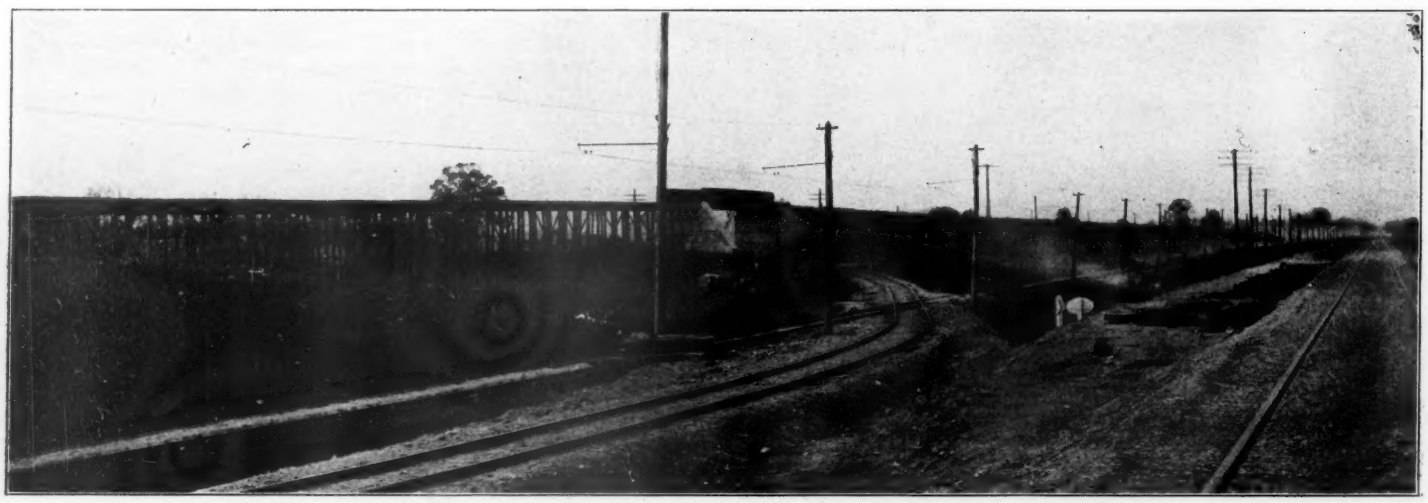


Fig. 8—General View of Traction Line Change; Vandalia Track Elevation.

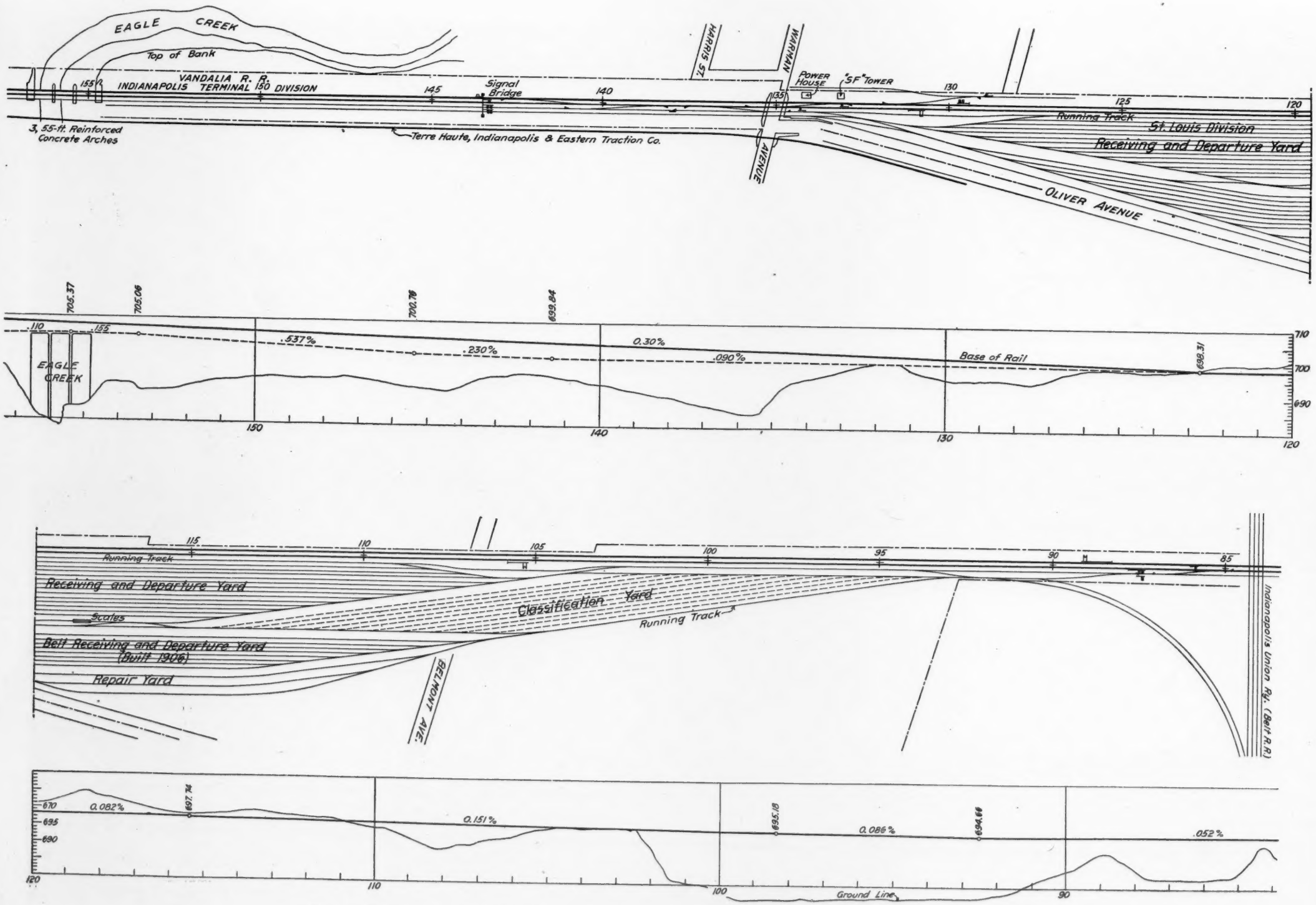


Fig. 6—Plan and Profile of Vandalia Tracks at Indianapolis from Belt Railroad Crossing to Eagle Creek.

creek connection to the St. Louis division. The change affected about 3,200 ft. of the traction line and, in addition to the heavy fill and the bridge over Eagle creek connection, required the construction of a double box subway for the highway near the east end of the change. A view of this subway and the fill at this point are shown in Fig. 9. The bridge over Eagle creek connection is 91 ft. between faces of abutments, on account of the sharp curvature at the point of crossing.

Enlargement of the terminal freight yard of Fig. 6 is part of the work. Indianapolis is the terminus of the Vandalia, which is controlled by the Pennsylvania Lines, but operated independently. Through freight traffic between the Vandalia and the Pan Handle (P., C., C. & St. L.) is interchanged by way of the Belt. The drawing shows the addition last year of trackage for a Belt receiving and departure yard and for repair tracks; also the contemplated addition of a classification yard at the east end. Entrance to the yard is at the west end, and an electric interlocking plant is being installed for the control of this entrance. The positions of this tower, called S F tower, the power house for the plant and the signal bridge are shown in Fig. 6. The signal bridge spans four tracks, the most southerly being a drill track for the yard. Electric automatic signals are being installed from Union Station to S F tower.

The heaviest work on the grade revision and second track work is Ben Davis cut at the western end of the work. This cut is 7,000 ft. long, 16 ft. deep at maximum point and contains about 226,000 yds. It has supplied a good part of the filling material for all of the work here described. However, a part of the work east of White river was filled with the strippings from a large gravel pit opened up a short distance west of Eagle Creek. The new work is being ballasted with gravel from this pit. With the exception of the masonry and bridges, all work is being done by company forces. The track elevation work is practically completed. This and the other improvement work is being done under the general supervision of F. T. Hatch, Chief Engineer of the Vandalia. R. K. Rochester, Principal Assistant Engineer, is in immediate charge, assisted by H. T. Sympson, Assistant Engineer. All steel work was designed in the office of J. C. Bland, Engineer of Bridges of the Pennsylvania Lines West of Pittsburgh.

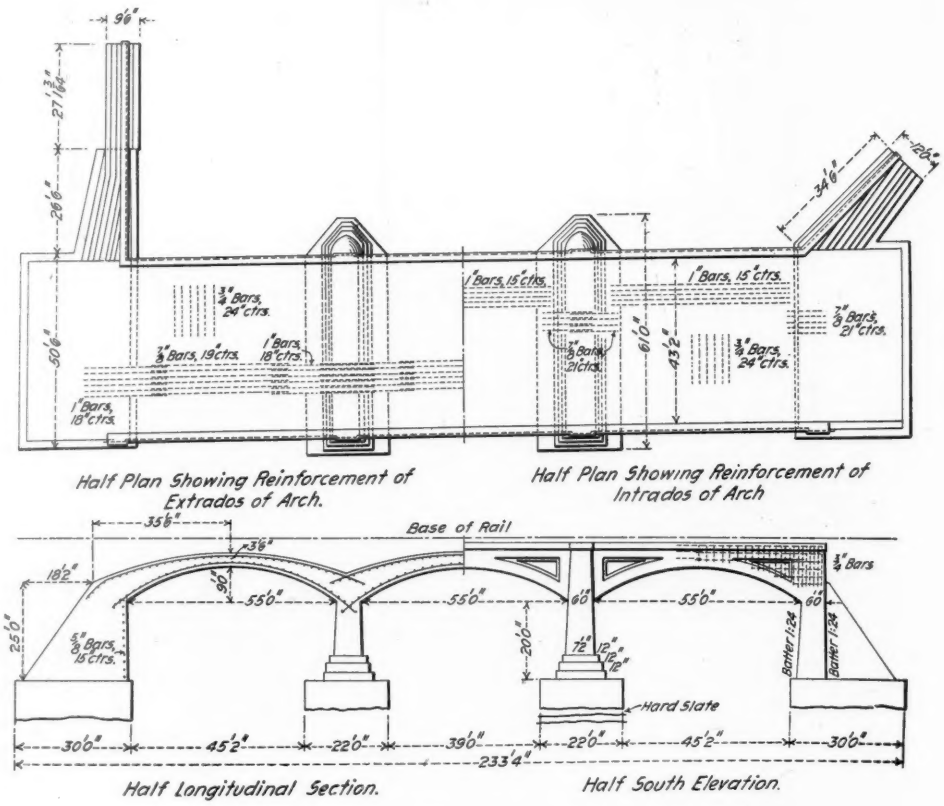


Fig. 7—Plan and Elevation of Eagle Creek Bridge.

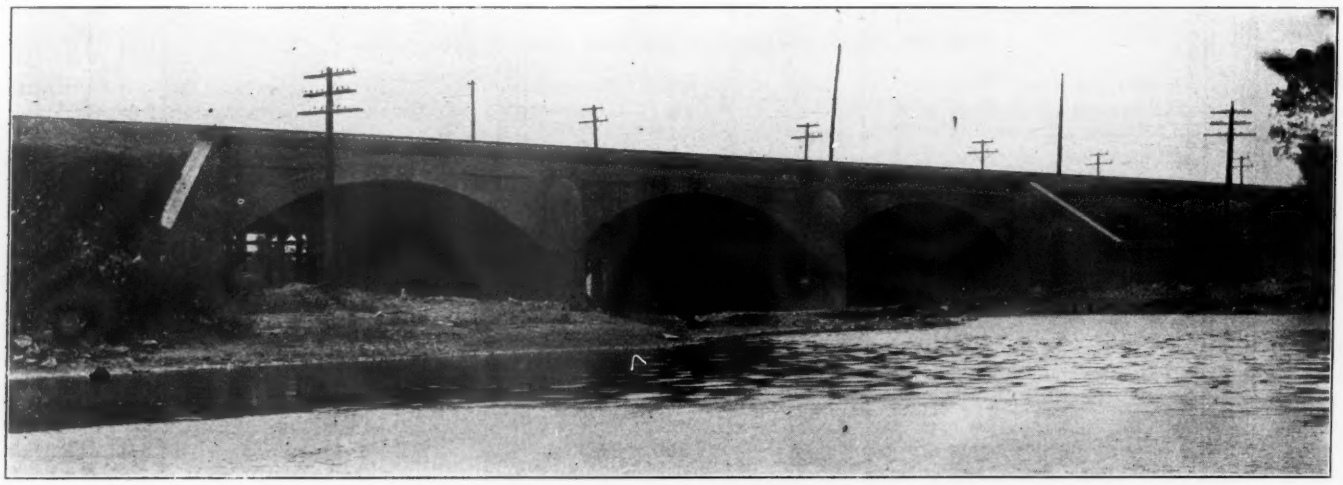


Fig. 10—Concrete Arch Over Eagle Creek; Vandalia Track Elevation.

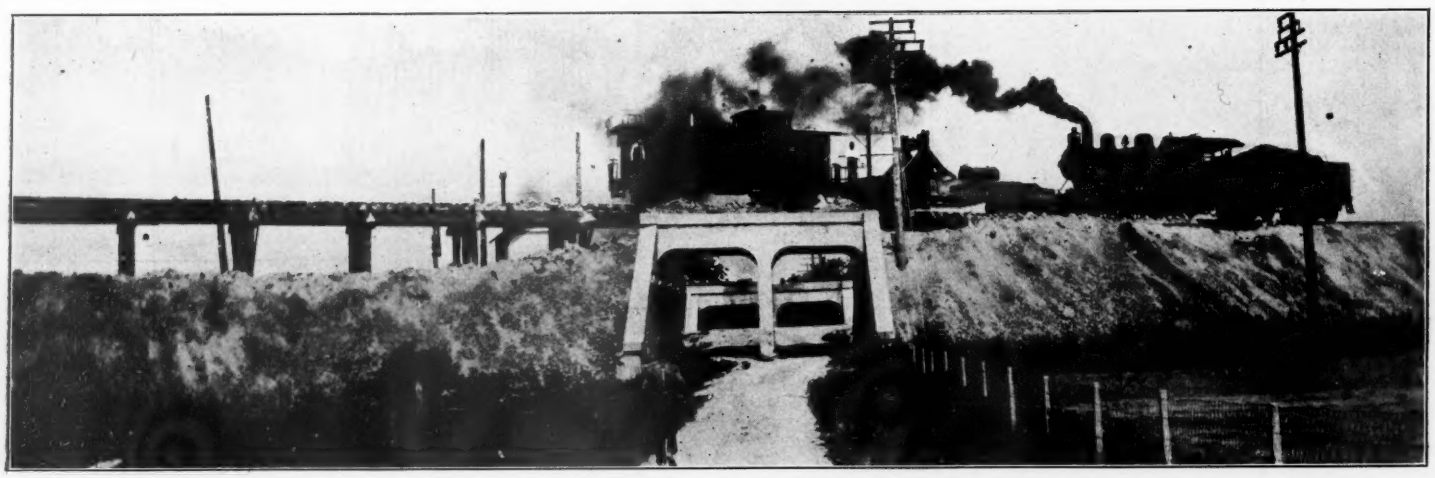


Fig. 9—Double Box Center Subway for Highway on Traction Line Change; Vandalia Track Elevation.

Railroad Built in 1907.

UNITED STATES.

Table Showing Mileage Built in 1907, Classified by States.

	No. of Cos. building.	1907.	No. of Cos. building.	1906.
Alabama	6	154.82	8	81.90
Alaska	4	91.00	1	15.50
Arizona	1	26.66	3	47.81
Arkansas	11	96.37	19	260.24
California	12	240.19	11	139.47
Colorado	3	22.38	8	113.36
District of Columbia	1	7.60	1	1.00
Florida	11	251.65	12	205.75
Georgia	5	132.92	7	182,90
Idaho	5	135.89	6	184.40
Illinois	4	15.54	9	119.41
Indiana	8	101.82	6	101.03
Indian Territory	3	63.60	2	99.40
Kansas	2	16.25	3	53.12
Kentucky	5	48.33	7	54.57
Louisiana	13	384.72	12	333.84
Maine	1	27.75	4	44.71
Maryland	1	25.50	..	.....
Massachusetts	..	.....	1	4.50
Michigan	7	28.85	3	24.80
Minnesota	6	158.09	6	138.07
Mississippi	9	201.29	8	165.14
Missouri	7	86.15	4	29.50
Montana	4	191.75	1	26.00
Nebraska	2	37.51	3	174.55
Nevada	7	218.30	4	282.05
New Jersey	1	0.56	1	2.67
New Mexico	2	83.80	2	151.00
New York	9	40.39	3	95.02
North Carolina	9	148,83	4	34.00
North Dakota	3	183.88	2	247.47
Ohio	2	29.98	4	61.00
Oklahoma	4	159.60	2	36.00
Oregon	3	31.70	7	61.11
Pennsylvania	19	121.78	14	117,72
South Carolina	5	57.50	3	41.00
South Dakota	7	337.73	6	388.23
Tennessee	12	56.45	6	65.00
Texas	18	339.32	18	634.67
Utah	2	24.10	6	153.52
Virginia	7	177.82	5	121.27
Washington	7	324.54	5	103.06
West Virginia	8	145.97	5	78.78
Wisconsin	5	116.87	5	141.84
Wyoming	4	66.71	3	206.95
Total	265	5,212.46	250	5,623.33
Canada	12	976,70	15	1,007.05
Mexico	9	333.03	8	296.50

UNITED STATES.

ALABAMA.

Alabama Western (Ill. Cent.)—Between Mississippi state line and Haleyville, 36.61 miles; Birmingham terminals 2.06 miles; total.	38.67
Atlanta, Birmingham & Atlantic—Georgia state line west toward Talladega	79.80
North Alabama (L. & N.)—Extension of Cain Creek branch, on Skelton Creek extension from Vulcan to Praco	13.00
Southern—Extension of Flat Top Spur to point beyond Village Creek, 4.26 miles; Spur lines, 1.59 miles; total	5.85
South & North Alabama (L. & N.)—Acton Basin line from main line near Helena to Acton Coal Basin	6.50
Tombigbee Valley—Healing Springs north to Silas	11.00
	154.82

ALASKA.

Alaska Central—North toward Fairbanks	21.00
Seward Peninsula—Little Creek to Sunset, 6.00 miles; Little Creek Junction to McDonald, 7.00 miles; end of track to Shelton, 1.00 mile; total	14.00
Tanana Valley—Gilmore to Chatanika	21.00
Copper River & Northwestern—Katalla east toward Bering river coal fields; Ktalla west and northwest	35.00
	91.00

ARIZONA.

Arizona & California (A., T. & S. F.)—Mile 80.18 near Bouse, west to mile 106.84, one mile west of Parker	26.66

ARKANSAS.

Arkansas, Oklahoma & Western—Springtown to Siloam Springs	10.00
Bauxite & Northern—Bauxite to Bauxite Junction	3.00
Crittenden Railroad—Wildcat to Parkin Junction	2.00
Dardanelle, Ola & Southern—Dardanelle to Ola	15.00
El Dorado & Wesson—Wesson north	3.00
Gurdon & Fort Smith (Mo. Pac.)—To Caddo Gap	3.85
Gurdon & Fort Smith Northern (Mo. Pac.)—Caddo Gap north to Womble	5.52
Little Rock, Maumelle & Western—Little Rock to Douglas	16.00
Missouri & North Arkansas—From Lesile southeast toward Helena	20.00
Osceola, Little River & Western—Giles to Youngs	2.00
Prescott & Northwestern—Helbig to Cheney, 10.00 miles; Rosoboro to Spears, 6.00 miles; total	16.00
	96.37

CALIFORNIA.

Bay Shore (So. Pac.)—Between San Francisco and San Bruno	7.68
California Northeastern (So. Pac.)—Between Weed and Klamath Falls	13.74
Coast Line (So. Pac.)—Between Santa Cruz and Davenport	7.10
Empire Railway (So. Pac.)—Rossi to Stratton	8.26
Nevada, California & Oregon—From 10 miles north of Madelin to Likely	10.00
Northwestern Pacific—Wendling to Floodgate	1.80
Pajaro Valley Consolidated—Salinas to Alesae Junction	2.30
Peninsular (So. Pac.)—Between Mayfield and Vasona	7.69
Southern Pacific—Smeltzer to Benedict	4.62
Tonopah & Tidewater—Dumont north to Nevada state line, 56.00 miles; branch Death Valley Junction to Lila C mine, 7.00 miles; total	63.00
Western Pacific—Stockton to Sacramento, 43.00 miles; Marysville to Junction, 48.00 miles; total	91.00
Yosemite Valley—North Fork to El Portal	23.00
	240.19

COLORADO.

Colorado & Southern—Marshall to Eldorado Springs	3.00
Denver, Northwestern & Pacific—Near Kremmling west to Yarmony	17.50
Rio Grande—Strong to Tioga	1.88
	22.38

DISTRICT OF COLUMBIA.

Philadelphia, Baltimore & Washington (P. R. R.)—Maryland state line to Washington	7.60

FLORIDA.

Apalachicola Northern—Point three miles south of Guest south to Apalachicola	60.00
Atlanta & St. Andrews Bay—Cottontail south to Youngstown	31.00
Atlantic & Eastern Coast Terminal—At Jacksonville	2.50
Charlotte Harbor & Northern—Ft. Ogden to Boca Grande	37.00
Florida Central—Delph to Maysville	15.00
Florida East Coast—Largo Key south toward Key West	44.00
Peninsula Railway—Between Bartow and Tampa	1.00
Plant City, Arcadia & Gulf (S. A. L.)—Plant City south	7.25
Seaboard Air Line—Terra Ceia Junction to Terra Ceia	5.40
Tampa Northern—Hillsboro river north to Brooksville	44.50
Woodville Railroad—Lavender to Spring Hill	4.00
	251.65

GEORGIA.

Atlanta, Birmingham & Atlantic—Chattahoochee river west to Alabama state line, 4.40 miles; Manchester to Atlanta, 77.40 miles; total	81.80
Bostwick—Apalachee to Bostwick	6.00
Brinson Railroad—Savannah north to Springfield	25.00
Florida Central—Thomasville to Roddenbury	13.00
Louisville & Nashville—Atlanta connection from Hills Park yard to West End, Atlanta	7.12
	132.92

IDAHO.

Idaho & Washington Northern—Grand Junction north to Washington state line, 33.80 miles; branch from Coleman east to Clagston Junction, 6.60 miles; total	40.40
Minidoka & Southwestern (O. S. L.)—Minidoka to Buhl	14.96
Northern Pacific—Culdesac southeast to Grangeville	55.00
Oregon, Washington & Idaho (O. R. R. & W. and Nor Pac.)—Lewiston west toward Washington state line	0.70
Yellowstone Park (O. S. L.)—Foggs Mill to Montana state line	24.83
	135.89

ILLINOIS.

Chicago & Western Indiana—96th street to 106th street, Chicago	1.25
Illinois Central—Between Herrin and Zeigler	2.00
Marion & Johnson City (Mo. Pac.)—Marion to near Johnson City	7.84
Wabash Southern (Mo. Pac.)—Five miles northeast of Zeigler to Benton	4.45
	15.54

INDIANA.

Bloomington Southern (Ill. Cent.)—Bloomington south	2.52
Chicago, Cincinnati & Louisville—Griffith to Louisville Junction	12.00
Cincinnati, Bluffton & Chicago—Bluffton northwest to Huntington	23.00
Evansville & Terre Haute—At Evansville	3.00
Gary & Western (C. L. S. & E.)—Dixie to Gary	5.00
Indiana Harbor (N. Y. C. Lines)—Gibson east	1.50
Indianapolis & Louisville (C., I. & L.)—Southwest between Wallace Junction and Victoria	29.00
Southern—Jasper northeast to West Baden	25.80
	101.82

INDIAN TERRITORY.

Midland Valley—Jenks west to Glen Pool	6.50
Missouri, Oklahoma & Gulf—Dustin south to Rose, 25.60 miles; Dewar branch, McDonald north to Walters, 4.50 miles; total	30.10
Oklahoma Central—Purcell to a point eight miles west of Blanchard	27.00
	63.60

KANSAS.

Denver, Enid & Gulf (A., T. & S. F.)—Sun City northwest to Belvidere	9.65
St. Joseph & Grand Island—Stouts to Highland	6.60
	16.25

KENTUCKY.

Kentucky Midland—Central City to Cypress Creek	8.00
Louisville & Nashville—Cumberland Valley division, up Left Hand Fork of Straight Creek, 0.55 miles; Chenoa branch of Bear Creek extension, from Chenoa to coal mines in Bell county, 2.25 miles; Caney Fork branch, from Chenoa branch, 1.10 miles; total	3.90
Morehead & North Fork—Morehead to Paragon	10.00
Morganfield & Atlantic (L. & N.)—Marganfield south to Providence	25.33
Pine Mountain (L. & N.)—From Knoxville division near Williamsburgh, finished from Savoy to Clear Fork river	1.10
	48.33

LOUISIANA.

Baton Rouge, Hammond & Eastern (Y. & M. V.)—Between Baton Rouge and Covington	20.75
Colorado Southern, New Orleans & Pacific (St. L. & S. F.)—Crowley branch, Eunice to Crowley, 23.00 miles; Kinder to Atchafalaya river, 64.44 miles; Atchafalaya river to Pt. Allen, 33.37 miles; total	120.81
Hammond & Houltonville—Nine miles west of Lawson City to Hammond	5.00
Jasper & Eastern (Gulf, Col. & S. F.)—Cravens east to Oakdale	24.50
Louisiana & Arkansas—Tioga to Pineville	5.02
Louisiana & Pacific (S. A. & S. S.)—De Ridder to Fulton, 26.00 miles; Fulton to Banks, 16.00 miles; total	42.00
Louisiana East & West (T. & P.)—Villeplatte southwest to Eunice	14.00
Morgan's Louisiana & Texas (So. Pac.)—Arnaudville to Port Barre	12.30
New Orleans Great Northern—Bogue-Chitto branch, Lawrence north toward Tylertown, Miss., 16.00 miles; on branch from Skidoll via Mandell to Abita Springs, 26.00 miles; total	42.00
Opelousas, Gulf & Northeastern (T. & P.)—Opelousas southwest to Crowley	33.00
Rock Island, Arkansas & Louisiana (C., R. I. & P.)—Alexandria to Eunice	55.34
Tremont & Gulf—Dodson south to Winnfield	10.00
	384.72

MAINE.

Bangor & Aroostook—South La Grange north to main line 4.56 miles west of Seboois	27.75

MARYLAND.

†Washington, Westminster & Gettysburg—District of Columbia boundary to Laytonsville	25.50

†Will probably be operated by gasolene motor cars.

MICHIGAN.

Au Sable & North-Western—Crooked Lake Junction to Curran	6.00
Detroit & Mackinac—Alpena to lower south branch of Thunder Bay river	6.38
Detroit Terminal—At Detroit	5.00
Duluth, South Shore & Atlantic—To mines	2.00
Grand Rapids & Indiana—Veneer to Falmouth	2.97
*Kalamazoo, Lake Shore & Chicago—Between Toquin and Paw-Paw	4.50
Keweenaw Central—Mohawk to Mineral Range Junction, 1.00 mile; Mandan to Keweenaw Copper Company's mine, 1.00 mile; total	2.00
	28.85

*Change in location of old main line.

MINNESOTA.

Big Fork & International Falls (Nor. Pac.)—Big Falls northeast to International Falls	34.00
Duluth & Northern Minnesota—Mile post 45 to mile post 50	5.00
Duluth, Missabe & Northern—Main line to Wacootah mine, 1.74 miles; Holman to Holman mine, 1.32 miles; total	3.06
Duluth, Rainy Lake & Winnipeg—Mile 50 to Rainier	43.00
Great Northern—Kelly Lake to Fermoy	23.40
Minneapolis, St. Paul & Sault Ste. Marie—Brooten to Mississippi river	49.63
	158.09

MISSISSIPPI.

Greenville, Elizabeth & Wolfs Mill (Southern)—Napance to Wolfs Mill, 5.00 miles; Wolfs Mill east to Kergs Mill, 6.60 miles; total	11.60
Leland-Southwestern (Y. & M. V.)—Leland southwest	8.60
Mississippi & Alabama (Ill. Cent.)—Between Ruslor and Alabama state line	39.79
New Orleans Great Northern—Mays Creek north toward Jackson	53.00
Natchez & Eastern (Miss. Cent.)—Brookhaven west to Homochitto river, 23.00 miles; Natchez east toward Brookhaven, 18.00 miles; total	41.00
Mississippi Central—Ten miles south of Hattiesburg toward Scranton	5.00
Natchez, Columbia & Mobile—Old Camp to Camp Eleven	3.50
Sunflower & Eastern (Y. & M. V.)—Between Blue Lake and Webb	4.61
Yazoo & Mississippi Valley—Tennessee state line south to Lake View, .60 miles; between Philipp and Charleston, 20.59 miles; between Silver City and Kelso, 13.00 miles; total	34.19
	201.29

MISSOURI.

Chester, Perryville & Ste. Genevieve—West Chester to Minnith	23.00
Mississippi River & Bonne Terre—Elvins south to Mitchell	4.00
Missouri & North Arkansas—Seligman northwest toward Joplin	15.00
Missouri Southern—Reynolds to Ohlman	4.00
Saline Valley (C., G. & C.)—Minnith to Klapek	5.00
Springfield Southwestern (Mo. Pac.)—Springfield to Crane	34.15
Versailles & Sedalia—to mines	1.00
	86.15

MONTANA.

Billings & Northern (Gt. Nor.)—Armington southeast towards Laurel	32.00
Butte, Anaconda & Pacific—Anaconda to Browns	6.00
Chicago, Milwaukee & St. Paul—Pacific Coast extension, between Ismay and Perry, 38.00 miles; Harlowton and Delphia, 92.30 miles; Whitehall west 4.30 miles; Butte east 9.30 miles; total	143.90
Yellowstone Park (O. S. L.)—Idaho state line to Yellowstone	9.85
	191 75

NEBRASKA.

Chicago, St. Paul, Minneapolis & Omaha—New Castle to Wynot	18.44
South Omaha & Western (Mo. Pac.)—Lane toward South Omaha	4.07
Union Pacific—Hordville west to Central City, 4.96 miles; Belmar to Luther, 10.04 miles; total	15.00
	37.51

NEVADA.

Bullfrog Goldfield (Ton. & Goldf.)—Springdale south to Beatty and Gold Center, thence northwest to Rhyolite	26.00
Caliente & Pioche (S. P., L. A. & S. L.)—Caliente north to Pioche	32.69
Fallon Railway (So. Pac)—Between Hazen and Fallon	1.11
Las Vegas & Tonopah—Rhyolite north to Goldfield	74.00
Silver Peak—Blair Junction to Blair	17.50
Tonopah & Tidewater—California state line north to Gold Center	28.00
Western Pacific—Utah state line west to Shafter	39.00
	218.30

NEW JERSEY.

West Jersey & Seashore (P. R. R.)—Wildwood branch extension, Wildwood to Wildwood Crest	0.56

NEW MEXICO.

Cimarron & Northwestern (St. L., R. M. & P.)—Cimarron northwest to Van Bremmer Park	36.00
Eastern of New Mexico (A., T. & S. F.)—between Texico and Belen 35.09 miles; Clovis to Cameo, 1.87 miles; Belen to Rio Puerco, 10.84 miles; total	47.80
	83.80

NEW YORK.

Adirondack & St. Lawrence—De Kalb Junction to Hermon	4.00
Delaware & Hudson—Rouses Point to connection with Napierville Junction Railway	1.10
Erie & Jersey (Erie)—between Guymard and Otisville	4.38
Genesee Valley Canal (P. R. R.)—Scottsville branch Scottsville to Garbutt	2.60
Glenfield & Western—Fish Creek to Menteola	2.84
Greenwich & Johnsonville—Greenwich to Salem Junction	11.00
Lehigh & Lake Erie (L. V.)—Tifft Farm (Buffalo) to L. S. & M. S. at West Seneca	3.00
Nypano Railroad (Erie)—Between Pennsylvania state line and Lakewood	10.47
Pittsburg, Shawmut & Northern—Approaches to bridge at Stony Brook Glen	1.00
	40.39

NORTH CAROLINA.

Carolina & Tennessee Southern (Southern)—West between Bushnell and Tennessee state line	4.50
Carolina Valley—High Point north towards Greensboro	2.00
Carthage & Pinehurst—Pinehurst to Carthage	12.50
Durham & South Carolina—Farrington to Coshwell	3.75
East Carolina—Three miles south of Farmville to Hookerton	10.20
Norfolk & Southern—Raleigh to Pamlico Junction, 2.19 miles; Zebulon to Chocowinity, 75.77 miles; Chocowinity to Washington, 3.8 miles; Bayboro toward Oriental, 8.30 miles; Mackeys Ferry toward Columbia, 5.00 miles; Edenton toward Skinners Point, 2.00 miles; total	97.06
South & Western—Altapass to present end of track, 0.77 miles; Marion to North Cove in McDowell county, 14.05 miles; total	14.82
Tallulah Falls—Prentiss to Franklin	4.00
	148.83

NORTH DAKOTA.

Chicago, Milwaukee & St. Paul—Pacific Coast extension, South Dakota state line to Ives	89.10
Great Northern—Berthold-Crosby line northwest to Crosby, 61.72 miles; Walhalla north to International boundary, 5.36 miles; total	67.08
Minneapolis, St. Paul & Sault Ste. Marie—Dogden to Max	27.70
	183.88

OHIO.

Lake Erie, Alliance & Wheeling (L. S. & M. S.),—Piney Fork south to Dillonvale	5.00
Lorain & West Virginia (Wabash)—Between Wellington and Elyria, 15.79 miles; branch to quarries, 9.19 miles; total	24.98
	29.98

OKLAHOMA.

Colorado, Texas & Mexico—Mangum south	14.00
Kansas City, Mexico & Orient—Clinton south to Dill City, 20.00 miles; North Fork Red river to Elmer, 27.00 miles; total	47.00
Oklahoma Central—Byers to Middleberg, 50.00 miles; Middleberg to Chickasha, 15.00 miles; total	65.00
Wichita Falls & Northwestern System—Texas state line north to Fredwick	33.60
	159.60

OREGON.

Central Railway of Oregon—From 6.73 miles beyond Union Junction to Con	5.20
Oregon Railroad & Navigation Co.—Elgin toward Joseph, 6.80 miles; St. Johns east to Woodlawn, 5.20 miles; total	12.00
Umatilla Central (O. R. R. & N.)—Pendleton to Pilot Rock	14.50
	31.70

PENNSYLVANIA.

Allegheny Valley (P. R. R.), Pennfield Branch—Pennfield to terminus	1.48
Baltimore & Ohio—Yorn Run branch on Connellsville division	1.15
Brookville & Mahoning (P. S. & N.)—Brockwayville south to Ramseytown, 33.00 miles; Beaver Run branch from three miles south of Brookville to Conifer, 5.00 miles; total	38.00
Columbus & Erie (Erie)—Between Columbus and New York state line	8.34
Eriton Railroad (Erie)—From B. R. & P. Ry to Erieton in Clearfield county	.72
Indian Creek Valley—Indian Creek to Rodgers Mills, 10.00 miles; branch Iron Bridge to Mill Run, 2.00 miles; total	12.00
Kyler Run (Erie)—From Toby branch north up Kyler Run Hollow in Elk county	1.42
Ligonier Valley—Branch, Ligonier to Wilpen	2.50
New Park & Fawn Grove (Stewartstown)—Between Stewartstown and Fawn Grove	2.00
Pennsylvania—Apollo branch extension, 0.21 miles; Wimper branch extension to Eureka mine, 0.80 miles; West Browsville to Junction with P. M. & S., 4.45 miles; Grindstone branch, 2.59 miles; Cambria and Clearfield division, Coal Run branch extension, 1.08 miles; total	2.13
Pennsylvania, Monongahela & Southern (P. R. R.)—From junction with Monon division to Millsboro	4.39
Philadelphia & Reading—On Philadelphia, Harrisburg & Pittsburgh branch in Cumberland county	.50
Pine Run (P. R. R.), P. & N. W. Div.—Junction with C. & C. Ry. south of Irrona	2.39
Pittsburgh, Binghamton & Eastern—Cedar Ledge to Powell	21.00
*Pittsburgh, Shawmut & Northern—Paine to Detsch	5.00
Rocky Ridge—Rocky Ridge north to Evanston	5.00
Susquehanna & New York—Pleasant Stream to Marsh Hill, 2.05 miles; Newberry to Newberry Junction, 2.15 miles; total	4.20
West Clarion (Erie)—Connection at Brockwayville with B., R. & P. Ry.	.76
White Deer & Loganton—Duncan Tea Springs to Loganton	8.80
	121.78

SOUTH CAROLINA.

Bennettsville & Cheraw—Bennettsville south to Drakes	11.00
Chesterfield & Lancaster—Pageland west	6.00
Due West—Donnells to Due West	4.50
Greenville & Knoxville—Greenville north to Marietta	15.00
Seaboard Air Line—Catawba Valley branch, Spence south to Great Falls	21.00
	57.50

SOUTH DAKOTA.

Chicago & North-Western—Between Bonesteel and Dallas	11.88
Chicago, Milwaukee & St. Paul—Pacific Coast extension, Cashmere west to North Dakota state line	65.50
Minnesota, Dakota & Pacific (M. & St. L.)—Two miles west of Northville west to Missouri river	89.61
Pierre & Fort Pierre Bridge & Ry. (C. & N.-W.)—From Pierre to connection with the P., R. C. & N. W. east of Fort Pierre	1.82
Pierre, Rapid City & North Western (C. & N.-W.)—Between Fort Pierre and Rapid City	65.02
South Dakota Central—Rutland north to Arlington	22.00
White River Valley (C., M. & St. P.)—Kadoka to Farmingdale	81.90
	337.73

TENNESSEE.

Illinois Central—Atoka to Kerrville	5.50
Jackson & Southeastern (Ill. Cent.)—Between Jackson & Perry	.37
Little River—Forks to First Crossing	4.00
*Change in location of old main line.	
*Louisville & Nashville—Adams to Forts	4.30
Memphis & Chattanooga (Southern)—Between Chattanooga and Alabama state line	6.20
Memphis & State Line (Ill. Cent.)—Between Woodstock & Leewood, .87 miles; between Auton and Nonconnah, 3.00 miles; total	3.87
Mobile & Ohio—Clamore to Jackson	2.00
Southern Railway—Spur lines	4.08
Swan Creek Railway (L. & N.)—Mt. Pleasant toward Flanagan	4.00
Tennessee & Carolina Southern (Southern)—North between Carolina state line and Maryville	12.00
Tennessee Railway—Smoky Straight Fork	4.00
Yazoo & Mississippi Valley—Etter south to Mississippi state line	6.13
	56.45

TEXAS.

Beaumont & Great Northern—Onalaska southeast toward Beaumont	15.00
Beaumont & Saratoga Transportation—Voth toward Saratoga	2.00
Beaumont, Sour Lake & Western (C. S., N. O. & P.)—Houston east to Trinity river	37.00
Caro Northern—Caro to Mt. Enterprise	16.50
Chicago, Rock Island & Gulf—North between Irving and Carrollton	3.50

Fort Worth & Denver City (C. & S.)—Alvord to Rock Quarry....	8.30
Galveston, Harrisburg & San Antonio (So. Pac.)—La Grange branch, Glidden to mile 7, .94 miles; Alleyton to Columbus, 1.07 miles; total	2.01
Kansas City, Mexico & Orient—Benjamin south to Knox City, 12.00 miles; San Angelo north 11.00 miles; total	23.00
Nacogdoches & Southeastern—Woden to Oil City, 4.50 miles; Hayward to Nacogdoches, 1.00 mile; total	5.50
Roscoe, Snyder & Pacific—Roscoe to Hamlegh	22.00
St. Louis Southwestern of Texas—Monterrey east to Broaddus....	9.70
Shreveport, Houston & Gulf—Prestige to Manning	9.00
Stephenville, North & South Texas—Stephenville south to Hamilton.	44.50
Texas & Pacific—West Port Arthur to Fort Arthur	3.21
Trinity & Brazos Valley (C. & S.)—From 32 miles north of Teague to Waxahachie	35.00
Trinity County Lumber Company Railroad—Groveton to Blix.....	22.60
Weatherford, Mineral Wells & Northwestern (T. & P.)—Mineral Wells northwest to Graford	20.50
Wichita Falls & Northwestern System—Wichita Falls north to Oklahoma state line, 17.00 miles; Wichita Falls south to Olney, 43.00 miles; total	60.00
	339.32
UTAH.	
Salt Lake & Ogden—Davis-Webster county line north to Ogden city limits	4.10
Western Pacific—Between Salt Lake City and Nevada state line....	20.00
	24.10
VIRGINIA.	
Chesapeake & Ohio—Covington to Jordan Junction	18.10
New River, Holston & Western—Beamer to Day	4.50
Norfolk & Western—Speedwell branch between Cripple Creek and Speedwell	1.72
South & Western—St. Paul to Bull Run	7.52
Virginia Air Line—Lindsay to Palmyra	17.00
Virginia-Carolina—Taylor's Valley to Konnarock	7.00
Virginia Railway—East of South Norfolk to east of Belt Junction, 1.44 miles; east of Adsil to west of Nutbush, 41.28 miles; west of Cub to east of Mansion, 35.69 miles; Hurt west 0.88 miles; east of Pembroke to east of Big Stoney, 6.40 miles; west of Hardy to west of Fagg, 36.29 miles; total	121.98
	177.82
WASHINGTON.	
Idaho & Washington Northern—Idaho state line north to Newport..	9.19
Ilwaco Railroad (O. R. R. & N.)—East between Ilwaco and Knappton	4.20
North Yakima & Valley—North Yakima west to Farmville	30.00
Oregon, Washington & Idaho (O. R. R. & N. and Nor. Pac.)—East between Riparia and Lewiston, Idaho	34.50
Portland & Seattle—Kennewick to Vancouver	220.00
Tacoma Eastern—Tilton to Glenavon	3.00
Washington & Great Northern (Gt. Nor.)—Between Molson and International boundary north of Chopaka	23.65
	324.54
WEST VIRGINIA.	
Buffalo Creek & Gauley—Dundon to Cushmont	9.00
Chesapeake & Ohio—Lawson up Sycamore Creek 0.60 miles; Dingen Run to Ethel, 4.50 miles; total	5.10
Coal River Railway (C. & S.)—St. Albans to Sproul, 15.20 miles; Sproul to Peytona, 14.00 miles; Sproul to Madison, 22.50 miles; total	51.70
Iron Mountain & Greenbrier—Not specified	4.00
Kanawha & West Virginia—Charleston to Blakesley	39.00
Morgantown & Kingwood (L. & N.)—Kingwood south to Rowlesbury	18.00
Norfolk & Western—Dey Fork branch, Berwind southeast to Canebrake	2.30
Virginian Railway—West of Ingleside, 1.44 miles; Macajah to east of King, 15.43 miles; total	16.87
	145.97
WISCONSIN.	
Chicago & North-Western—From one mile west of Marathon City to Rib Falls, 4.75 miles; between Elton and Van Ostrand, 6.37 miles; total	11.12
Duluth, South Shore & Atlantic—In Douglas county	.83
Wisconsin & Northern—Scott to Van Ostrand, 19.84 miles; north of Crandon to W. & N. Junction, 2.88 miles; total	22.72
Wisconsin & Michigan—Jarvis to Sycamore	1.20
Wisconsin Central—Ladysmith northwest toward Superior	81.00
	116.87
WYOMING.	
Chicago, Burlington & Quincy—Worland south to Kirby	20.45
Laramie, Hahns Peak & Pacific—From 15 miles west of Laramie to Centennial	15.00
Oregon Short Line—North Kemmerer branch, Kemmerer to mine..	7.26
Saratoga & Encampment—Walcott south to Saratoga	24.00
	66.71
CANADA.	
Canadian Northern—Edmonton, Alb., to Stony Plain, 21.00 miles; Edmonton to Morinville, 23.00 miles; total	44.00
Canadian Northern Quebec (Can. Nor.)—St. Jerome, Que., to St. Sauveur	10.00
Canadian Pacific—Milverton, Ont., west to Goderich, 51.50 miles; Neudorf, Sask., via Lanigan to point 26 miles west of Saskatoon, 252 miles; between Weyburn, Sask., and Stoughton, 12 miles; between Reston, Man., and Wolseley, Sask., 98 miles; total	413.50
Central Ontario—Bird's Creek, Ont., to Maynooth, 10.50 miles; Maynooth north, 2.00 miles; total	12.50
Grand Trunk Pacific—Between Winnipeg, Man., and Edmonton, Alb., 325 miles; between Knowlton, Man., and Fort William, 100 miles; total	425.00
Great Northern—International boundary north of Walhalla, N. D., north to Morden, Man., 15.25 miles.; Fernie, B. C., towards Michel, 10.00 miles; total	25.25
Maritime Coal Ry.—Fundy, N. S., to Joggins	1.00
Napierville Junction (D. & H.)—At St. Constant, Que., connection with Grand Trunk and Canadian Pacific	1.25
Niagara, St. Catherine & Toronto—Thorold, Ont., to Fronthill	7.50
Quebec & Lake St. John (Can. Nor. Que.)—In Quebec, Gosford branch mile 4 to Clarks, 1.50 miles; La Tuque branch, mile 28 to mile 40, 12.00 miles: total	13.50
Temiskaming & Northern Ontario—Mile 203 to mile 208, Waytayberg river, Ont.	5.00
Vancouver, Victoria & Eastern (Gt. Nor.)—From International boundary northwest to Keremeos, B. C.	18.20
	976.70
MEXICO.	
Cananea, Yaqui River & Pacific (So. Pac.)—From 15 miles south of Corral, Sonora, to Alamos, 76.80 miles; 16.3 miles north of Corrall to Cumuripa, 25.00 miles; total	101.80
Inter-Californa (So. Pac.).—Calexico southeast	19.24
Kansas City, Mexico & Orient—Chihuahua east, 6.00 miles; Minaca west, 12.00 miles; total	18.00
Mexican Central—Ocotlan to Atotonilco, 22.22 miles; Colima extension kilometer 201 to 217, 9.95 miles; kilometer 237 to 260, 14.30 miles; Guanajuato extension, kilometer 17.4 to 23.1, 3.52 miles; total	49.99
Mexican International—Sabinas to Rosita	10.00
Mexican Pacific Coast (So. Pac.)—Navojoa, Sonora, to San Blas Station, Sinaloa, on K. C., M. & O.	84.00
Parrall & Durango—South of Mesa de Sandia, Durango, kilo 75 to 80	3.00
Rio Grande, Sierra Madre & Pacific—Temosachic to Madre	32.00
San Juan de Oaxaca—Between San Pablo, Zimatlan, and Taviche....	15.00
	333.03

Trainmen's Hours in Great Britain.

The British Board of Trade has issued its statement of overwork by railroad employees in the month of July last, as reported by the companies under an order issued by the Board July 31. The Board now requires such a record for one month in each quarter of each year. Under the terms of the order the record must show the number of employees of different classes—trainmen, signalmen and examiners—who, on one or more occasions during the month have been on duty more than 12 hours at a time, or who, after so working, have been allowed to resume work with less than nine hours' rest. A second table is given showing a summary of these same periods of duty as they appear, after deducting time spent in traveling home on being relieved. The number of employees embraced in the report now given is 112,442, and in the month under review they worked 2,865,309 days. The number of days on which these men worked over 12 hours was 2.65 per cent. of the total days worked. The percentage, after making the deductions for time spent in going home, was in most cases about 10 per cent. less, although in the case of freight trainmen it was 50 per cent. less.

In connection with this subject American readers will be interested in a report of the conditions on the Lancashire & Yorkshire as investigated last May by Lieutenant-Colonel Druitt, whose statement was published by the Board of Trade in its annual report on employees' hours of labor. Investigations were made of conditions on other roads also. In England, as in the United States, the labor unions and the government together have forced the reduction of working hours of trainmen and signalmen to rigid limits, with the important difference, however, that on the British roads, as is indicated in the report above referred to, the limit beyond which it is held to be more or less dangerous for a trainman to work is 12 hours. On American railroads this period, 12 hours, is the practical limit which superintendents and trainmen use as a basis in preparing their schedules, but the government has not yet undertaken to declare trainmen overworked until they have been on duty 16 hours continuously.

Lieutenant-Colonel Druitt's report deals with the pay of the men, their hours and their holidays, the question of the sufficiency of the forces at division points and all the conditions surrounding their work. We quote his general statement and his chapter on "relief":

CONDITIONS ON THE LANCASHIRE & YORKSHIRE.

To move a large amount of merchandise on this railroad under existing conditions of trade, and at the same time to keep the men's hours within reasonable limits, is a difficult problem. Owing to the line being crowded with passenger trains during the day, and the way business is carried on by merchants, all goods traffic has practically to be done at night. The merchandise is rushed to the goods yard at the last possible moment after business hours, and the owners expect it to be delivered at its destination, perhaps 20 or 30 miles away, by the time the shops open next morning, quite forgetting that the goods have to be weighed, labeled, packed into trucks at the receiving yard, and the trucks to be then taken to marshaling sidings and made up into trains for the various destinations. Owing to the exceptional boom in the cotton trade during the last six months or more, the unusually large amount of goods to be moved has sometimes made the trains start very late, perhaps two hours or more after scheduled time. And as the amount to be carried is not known till the last moment, the enginemen and guards have to be in attendance with the engine at the schedule time, and be on duty perhaps two hours before starting. Also, owing to the abnormal amount of traffic resulting from the great boom in trade, the various trains block each other, especially at yards and junctions where branch lines join the main line, and wagons have to be transferred from one train to another, while very often the branch line trains are late. The result is that a train often gets four or five hours behind time in a distance of 30 miles, and takes perhaps 12 hours or more doing that distance. In East Lancashire especially the traffic between Manchester and Colne, Burnley, Accrington, Haslingden and Ramsbottom has been heavier during the last winter than ever known before.

Relief.—This is a difficult question to adjust. The regulations are as definite as possible, but it has been found impossible to carry them out during last winter so as to relieve every man before he has worked long hours; and as regards goods guards, if they did get relieved after 12 hours with a train, the time spent traveling after-

ward brought up the hours very often to 13 or over. It is impossible to provide relief at fixed points, as it is quite uncertain when the trainmen requiring relief will arrive at that point, and if an average time is fixed the train may pass before the men require relief. Then, as shown above, the traffic is almost all at night, when no passenger trains are running, and if a man starts duty at 6 or 7 p.m. he will require relief at some point not known until he telegraphs from it at 4 or 5 a.m. So it is often impossible to get relief to him except perhaps by another goods train or light engine; and if the men are relieved they may have to wait an hour or two for a passenger train to take them home, or they may get part of the way by a goods train or light engine. Sometimes relief men just miss the men to be relieved, as trains cannot be kept waiting when they have the road, and so the relief men have to follow after the others the best way they can. Sometimes, also, a man who wishes to make long hours will wire for relief at a place which he knows the relief man cannot possibly reach in time. The company showed me particulars of a number of cases where men had not carried out the regulations in asking for relief in time or in the proper manner, and so had worked long hours in consequence. That this is done by a few young unmarried men, who wish to make long hours and earn extra wages, was admitted by men to me in private; but, as a rule, the best men are only too glad to get home as soon as possible. As a rule the men did get relieved, except during fog and bad weather, but after being in charge of a train for 12 hours and then traveling afterward made the hours excessive.

Lieutenant-Colonel Druitt finds that wipers only 18 or 19 years old are frequently employed as firemen where it is necessary to relieve the older men after they have worked 12 hours, and a large number of such lads are being taken into the service. The railroad companies, in their endeavors to meet the severe demands of the government, make much (in their reports) of the fact that men can rest while on their way home after ending a tour of duty, but it appears that on these trips the men often have to ride in a caboose or a locomotive, so that Colonel Druitt thinks they do not rest much.

The only definite recommendation made by the inspector is that there should be a minimum limit of rest time between tours of duty, exceptions to be allowed only under very special or urgent circumstances. It appears that last winter was exceptionally severe on the railroads. There was an unusually heavy movement of freight, there was much fog and snow and much sickness of the men. Under these conditions the number of trained men at the disposition of the company was not large enough.

Protecting Steel Bridges Against Brine from Refrigerator Cars.*

The committee is agreed on two points: That the proper remedy for the trouble is in so constructing the cars that the brine can be retained till it can be drawn off by the train hands without injury to structures; and that no paint has been found that is effective in protecting the metal.

Mr. Berg (L. V.) reports: "The Lehigh Valley has not adopted any special construction methods for the protection of bridges against the action of salt brine from refrigerator cars, except the ordinary protection of the steel work by paint. We have found no satisfactory paint thus far to withstand this action for any length of time, so that certain parts of the bridges, depending upon local conditions and class of construction, have to be painted every year."

Mr. Montzheimer (E., J. & E.) says: "The best way to obviate this trouble is to have the drips from the refrigerator cars piped to the center of the track and then protect our bridges so that water dipping on the center of the track will not go to the steel work."

Mr. Draper (Ill. Cent.) sends a sketch of a protection that is proposed to be tried on his road. He says: "The print shows the proposed method of protecting our floor system from salt water and from the weather. It is a galvanized iron box trough used as a spacing block between the ties, and made with a pitch in order to turn the water off very rapidly. This protects the floor system from the rust from the rails, which is as bad as salt brine in destroying the paint. We have used on this road all classes of paint, but have not found anything that will overcome salt water, and I think that in the future we will have to resort to this method of covering to keep off the dirt, rust and salt water from the steel.

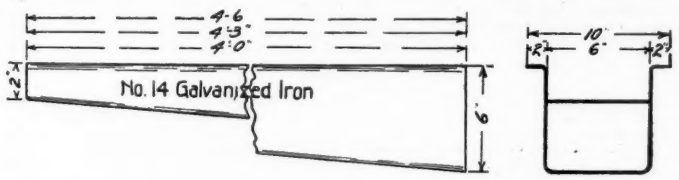
"Our estimated cost of putting an ordinary deck on a steel structure is $4.50 per foot for labor and material. This method of covering will add $1.65 per foot, making a total of $6.15 per running foot; and I am satisfied that we will receive better results by keeping our steel work properly covered with paint. This is to be used for deck and through plate girders and through truss spans. The girders and spans where we have the corrugated floor system and use a 6 in. x 8 in. yellow pine tie, should be covered on the outside of the rail with 1½-in. matched lumber. This will overcome the drip from falling direct on to the steel."

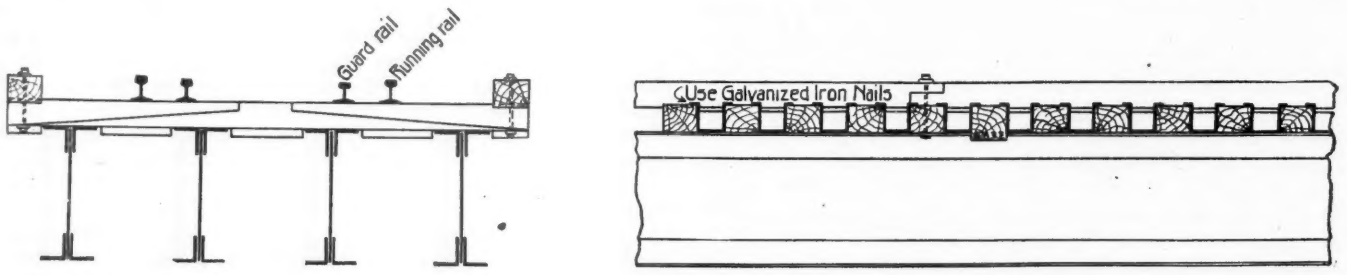
The committee recommends that all equipment which scatters salt brine along the line of tracks be provided with a copper tank on each car with sufficient capacity to hold all the salt brine that may be made from melting ice, and have it emptied at destination of car, or at points where such car is re-iced. The practice of scattering salt brine should be stopped; and it can be stopped much cheaper and with better results than to try to protect the structures from such action.

In 1898, at the Richmond meeting, a report on this subject estimated that one refrigerator car would produce about 200 gals. of brine in 24 hours. The suggestion was made that the cars be piped so that the brine be discharged at center of track and the structures provided with troughs to carry it clear of the metal work. In the discussion of this report, tanks were suggested and a method of filling between the ties with blocks bedded in paint somewhat similar in principle to Mr. Draper's scheme. President Berg stated that the Master Car Builders' Association had considered this matter and a committee had submitted two schemes, one of which, consisting of piping to center of track and discharging through a hose reaching nearly to the ground was adopted by the association as "Recommended Practice."

At the Quebec meeting, in 1903, Benjamin Douglas, of the Michigan Central, described his method of applying asphalt to floor plates by heating the iron and pouring on hot asphalt. This formed a sort of enamel, the asphalt adhering to the iron perfectly. A modification of this method could be applied to ordinary floors affected by brine drippings. It was also suggested at this meeting that tops of stringers and floor beams be covered with ready roofing or similar material as a protection from brine.

At the Pittsburg meeting, in 1905, Mr. Reid, of the Lake Shore, and Mr. Cartlidge, of the Chicago, Burlington & Quincy, reported on the use of roofing felt on stringers; the latter finding it satisfactory and the former stating that it soon cut through. Mr. Loweth, of the Chicago, Milwaukee & St. Paul, stated that he was trying "iron bark," a proprietary material consisting of canvas ducking saturated in a preparation of linoxyn and a resinous flux. A recent letter from Mr. Loweth states that on several spans of deck girders with creosoted timbers laid close and covered with ballast, the "iron bark"





ELEVATION

Proposed Method of Protecting Floors of Iron Bridges from Brine and Water; Illinois Central.

placed over the girder flanges under timber was in perfect condition after two years' wear. On several standard-floor bridges with 4-in. spaces between ties, the "iron bark" had cut through under the ties or crimped up between them. The material and its application is expensive and except in the case of solid continuous timbering does not seem to be entirely satisfactory. It is the material used for covering the cables of the Williamsburg bridge at New York.

The report is signed by R. P. Mills, chairman; A. Montzheimer, Walter G. Berg, F. O. Draper, Charles Carr.

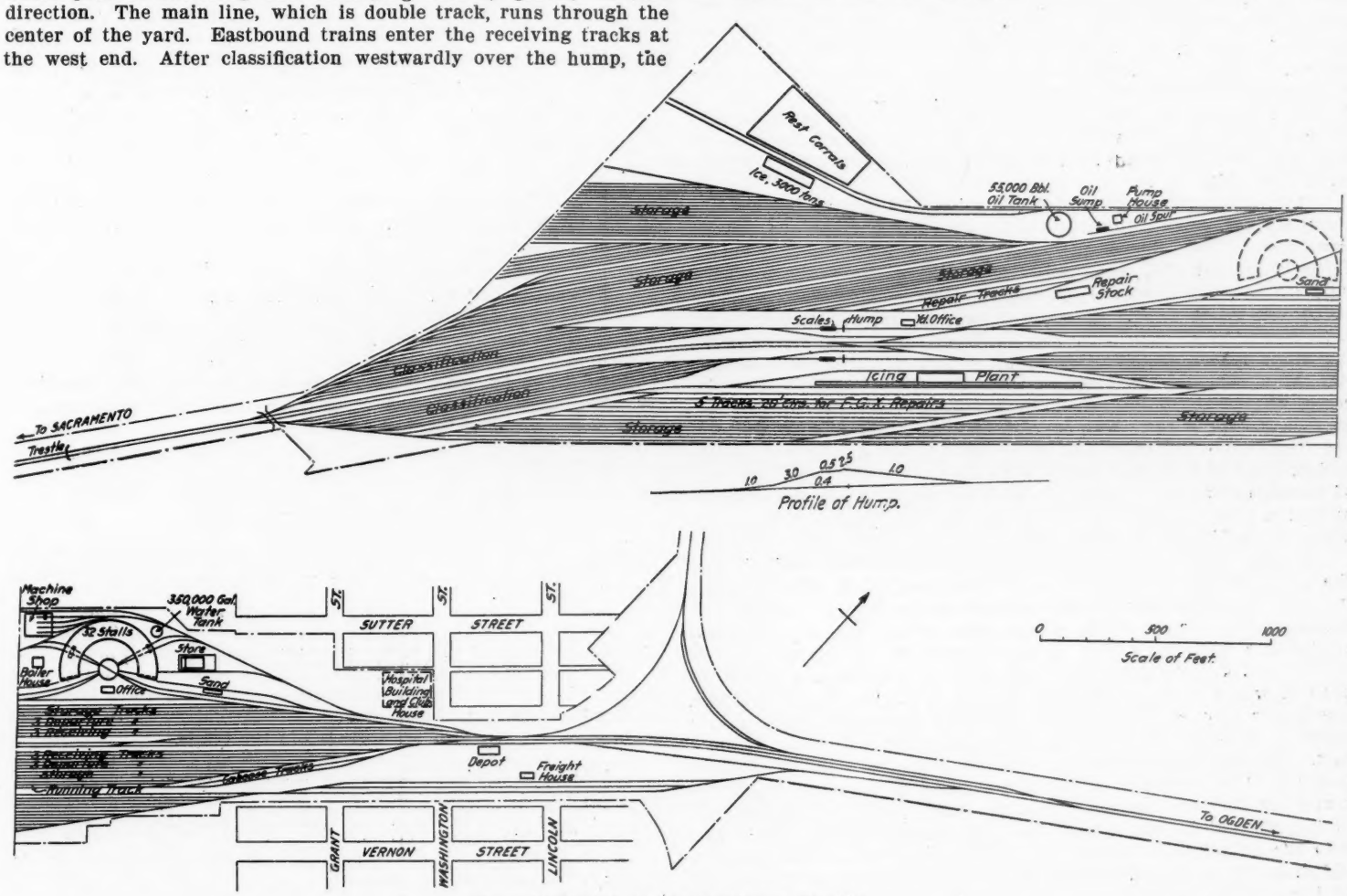
*Abstract of a report to the Milwaukee convention of the Superintendents of Bridges and Buildings.

The Roseville Yard of the Southern Pacific.

A plan of the yard lately completed by the Southern Pacific at Roseville, Cal., is shown herewith. The arrangement is somewhat peculiar, due to the physical condition of the site. Roseville is about 18 miles northeast of Sacramento, and is the junction of the line to Ogden and what is known as the east side line in the Sacramento valley. The San Francisco-Portland line follows the west side of the valley. The two join at Tahama, 105 miles north of Roseville.

The situation of Roseville with respect to Sacramento, and the proximity of the Sierra Nevada mountains on the east, made it necessary to have at this point a receiving, departure and classification yard. Freight coming into Sacramento from the west or south is forwarded north or east from Roseville, and vice versa. Trains coming over the mountains are made over at Roseville for the lighter grades of the Sacramento valley, while through trains bound east have to be broken up into sections for the heavy mountain grades.

The yard has two humps, but it will be observed from the plan that all of the classification tracks are at the western end. This is because the yard is on a 0.4 per cent. up-grade eastwardly, which would prevent switching and classifying cars by gravity in that direction. The main line, which is double track, runs through the center of the yard. Eastbound trains enter the receiving tracks at the west end. After classification westwardly over the hump, the cars are drawn back by way of the run-around tracks to the departure tracks. There is ample storage room, and provision is made for doubling the present engine house accommodations.



Roseville Yard of the Southern Pacific.

Electric Railways in Sparsely Settled Communities.

BY E. P. ROBERTS.*

There are three general classes of electric roads: the city, or urban; the suburban, and the interurban. The city line proper is one lying entirely within the limits of a city, and, in general, its receipts depend on the magnitude (population and area) of the city rather than on the population per mile of road, as in small cities the distance from residence centers to business centers is usually short, and people can and do walk. On the other hand, in the large city, the distance between residence and business centers is usually large, and people ride more frequently than in the other case. As a result there may be a smaller population per mile of road in a large city, and yet such road may have far greater receipts per mile mile of track is greater.

Suburban roads are usually an extension of the city system and operate on highways, frequently with cars of the city type. The schedule provides for rather frequent stops, though less in number than for an interurban road. Suburban roads may be classified as those connecting a terminal city with one or more outlying towns and villages, and those which serve a suburban residence district. Generaly speaking, the latter class will show greater earnings per capita for equal density of population, excluding the population of and per capita than in the smaller city, where the population per the terminal city from the population per mile of road.

Freight traffic on a city road is nearly always a negligible quantity, but in the case of a suburban or interurban road may reach a very respectable value. The electric roads doing the largest freight business are usually those which run through the most sparsely settled districts. This is frequently due to the fact that the steam freight service in such district is limited, or entirely absent. It is also a fact that such roads are generally built with the expectation of doing a considerable freight business, or are forced to develop such business because of the small passenger traffic. As the light passenger traffic can be taken care of by cars operating under considerable headway, the track is available for freight service. In most cases such roads have single track, with sidings of such length and location as may be required.

Not infrequently suburban roads, or those which should properly be designed as suburban roads, are equipped with large and heavy cars geared for high maximum speeds and attempt to make fast schedules, while at the same time doing a suburban business and making frequent stops. Such practice is almost always uneconomical, as it gives on the one hand, a poor suburban service, the cars being too large, the seating not best suited to the service, the headway infrequent; on the other hand, a wretched interurban service. A heavy car geared for high speed is very poorly adapted to suburban service with its frequent stops, and also results in an excessive amount of power for the service given. Where the number of stops is large, it is folly to gear a car for high schedule speed. In fact, with from six to eight stops per mile it is useless to gear a car for a higher speed than from 25 to 30 miles an hour, as no gain in schedule speed at all commensurate with the cost can thereby be obtained. Another difficulty arising from the use of large and fast cars for suburban service is the necessity for the high rates of acceleration which are required in order to make the time card when the traffic is heavy and the stops numerous. Such high rates of acceleration require large and expensive motors, and make heavy demands on the power house, sub-station and line.

The equipment on interurban roads should always be geared for the very lowest speed that will make the required schedule, plus a sufficient margin for delays. Any higher gearing results in an

*Abstract of a paper read by E. P. Roberts, of the Roberts & Abbott Company, Cleveland, Ohio, before the American Street & Interurban Railway Association.

unnecessary expense for car equipment, in some cases unnecessarily high repair bills, unnecessary expense for power, and also a larger power house and sub-station equipment than would otherwise be required. The motor equipment selected should always be of ample capacity for the work which it has to do. New equipments may be heavily loaded for a long time before the effect of such overloading becomes evident, and smaller overloads are slow to show their effect. But when the trouble once starts it comes all at once. It sometimes happens that a road will increase its schedule speed, making the necessary changes in gearing to secure the required maximum speed, and apparently everything is lovely, but in one to two years there comes a sudden epidemic of burnt out armature and field coils, and within a very short period it is necessary to rewind practically every motor on the road. This is the inevitable result of long continued overload.

The entire population directly on the route should always be considered in estimating probable earnings. When one city greatly preponderates it should be excluded, but its population noted. For sections a greater or less distance from the route we use a percentage based on local conditions, and take into account the character of the population, the reasons for travel and the comparative facilities, including accessibility. For example: Near the principal city a person residing three miles or less from the corporation limits of the city, and three miles from the proposed road, would seldom, if ever use it, whereas, if he were a considerably greater distance from the city, and three miles from the road, he would use it almost as much as if he lived directly on the route, provided that there was not another electric or a steam road nearer to him. If such road were a steam road consideration would be given to the service provided by it.

It is also evident that if the location of the proposed road is along a river, especially a wide river with few bridges, the population on the other side of the river from the road has lessened in value; it might not, geographically speaking, be a quarter of a mile distant, but from the standpoint of accessibility may actually be several miles away. In some cases and because of connection with steam or electric railroads, or river transportation, or existing stage routes, considerable value should be given to a population at a considerable distance from the route, whereas in other cases, and as above indicated, the population quite near the route may have little value. The population so obtained is what we term the "equivalent" population, by which is meant the population, which, if all of it were directly on the route, would equal in amount of travel the actual population as it is actually located. For example: a population of 1,000 may be considered as equal to 100 or 200 or more directly on the route.

Usually it makes little difference to the interurban road whether the principal city has 100,000 or 500,000 population, provided that it is the principal city in that general section of the country, and therefore the one to which all business tends. If the interurban road has a pleasure resort, it might seem fair to assume that it would receive more passenger traffic from a terminal city of 500,000 than it would from a smaller terminal city. On the other hand, the larger city will have more places of amusement, and it is a question whether such seeming probable result will prove to be a fact. The freight and express business *from* the principal city depends on the conditions along the route, and the same is true of travel for business reasons, and also largely for social reasons, and is not affected by the size of the principal terminus. The travel *into* the principal terminus is not affected by its population, provided, as before stated, it is the principal city in the general section of the country. The receipts per capita depend upon the reasons for travel, comparative facilities, habits of the people, character of population, comparative costs of travel, etc.

The following examples show on typical roads the relation between receipts per capita and population per mile of road, exclusive of the population of the terminal city.

Road No. 1 is a double-track interurban in the central west, with its terminal in a large city, but having no other towns of any considerable size. It has a rather large suburban resident population, especially during the summer, and the double-track main line of the road is paralleled by a third track operated by the same company, and two or three miles from the main line, but connecting with it at both ends. The earnings include both lines. The population of the principal city is excluded. Its data are:

	1904.	1905.
Population, total	20,402	20,692
Population, per mile	463	470
Earnings, total	225,751	245,809
" per mile	5,130	5,560
" per capita	11.06	11.84

Road No. 2 is a 42-mile road in the central west, having a medium-sized terminal city, the population of which is excluded from the total.

	1904.	1905.
Population, total	38,469	40,005
Population, per mile	915	952
Earnings, total	181,201	173,153
" per mile	4,314	4,123
" per capita	4.71	4.33

Road No. 3 is a 34-mile road having several small cities, whose population is included in the totals.

	1904.	1905.
Population, total	71,338	73,249
Population, per mile	2,100	2,150
Earnings, total	136,918	147,851
" per mile	4,000	4,330
" per capita	1.90	2.20

Road No. 4 is a 39-mile road having a large terminal city and one smaller terminal city. The larger city is excluded and the

Road No. 5 is an 80-mile road in the central west, having only

Population, total	28,424	28,781
Population, per mile	730	740
Earnings, total	225,410	248,912
" per mile	57,880	6,300
" per capita	7.90	8.60
" per mile	2,572	2,885
" per capita	2.56	2.82

Road No. 6 is also a road in the central west, 30 miles in length, and having one medium-sized city, the population of which is excluded from the totals.

	1904.	1905.
Population, total	32,373	32,993
Population, per mile	1,079	1,100
Earnings, total	85,055	80,100
" per mile	2,835	2,770
" per capita	2.66	2.43

Road No. 7 is a road in the central west, having one large and one very large terminal city; both of these are excluded from the totals; miles of track, 160.

	1904.	1905.
Population, total.	116,993	118,957
Population, per mile	731	743
Earnings, total	660,000	699,339
" per mile	4,125	4,370
" per capita	5.64	5.87

Road No. 8 is also in the central west, having 92 miles of track and one large terminal city, the population of which is excluded from the totals.

	Last half '04-first half '05.
Population, total	85,082
Population, per mile	924
Earnings, total	404,880
" per mile	4,400
" per capita	4.75

Road No. 9 has one large, one medium and one small terminal city. The large terminal city is excluded and the other is included in the total; miles of track, 45.

	1904.	1905.
Population, total	59,166	62,124
Population, per mile	1,315	1,353
Earnings, total	234,278	223,605
" per mile	5,205	5,000
" per capita	3.95	3.60

Road No. 10 is a large road in the central west, having 134 miles of track, and one very large terminal city, the population of which is excluded.

	1904.	1905.
Population, total	92,539	94,200
Population, per mile	692	702
Earnings, total	475,361	543,226
" per mile	3,547	4,054
" per capita	5.13	5.87

Road No. 11 is a 59-mile road in the central west, having three small cities, all of which are included in the totals.

	1905.
Population, total	52,052
Population, per mile	887
Earnings, total	197,934
" per mile	3.475
" per capita	3.80

Having obtained the "equivalent" population, as already described, the next and most important step is to determine the probable income per capita. Consideration must be given to the reasons for travel, comparative existing facilities, including railroad timetables and rates, and possibilities or probabilities of existing or of other proposed roads furnishing increased facilities. The habits of the people must be studied, the existing trend of traffic and every factor which may influence the situation. Some of these factors can be given an approximately definite value, and others are largely a matter of experience. The same method is followed in connection with freight, both package and box freight, including milk, garden truck, etc., also mail, although the latter is not generally of great financial value, but policy may make it desirable.

Express matter and so-called package freight can usually be carried either in a special compartment of a regular car or in a special express car similar in general make-up to the passenger car used on the road, and, in either case, can be handled without interfering with the regular schedule and without any extraordinary demands for power. Bulk freight, on the other hand, to be profitable must be handled in fairly large quantities, and this requires the operation of train units of several cars. If such trains are run in the daytime when the regular passenger traffic is on the road, it necessarily interferes more or less with the regularity of the passenger schedule, as they move at slower speeds than the passenger trains. In addition, freight trains demand a large amount of power, consequently require a considerable addition to the power house, and also make it necessary to install sub-stations of such capacity as are required for one or more freight trains in addi-

tion to the regular load due to passenger cars. If there are a sufficient number of freight trains on the road to keep the additional machinery in the sub-stations reasonably well loaded this is not objectionable, but, on the other hand, if but one or two trains are on the road at a time it necessitates the installation of large capacity sub-stations, and consequently light average load and power efficiency. Where it is possible to haul freight during the night when passenger service is partially or entirely discontinued, it may be possible to avoid the installation of additional sub-station machinery for freight service. Even in this case, however, the freight haulage may involve the operation of several sub-stations to handle one or two trains, with a resulting low factor and poor efficiency in the sub-station. Another difficulty which arises in the hauling of heavy freight trains on the average interurban road, is that of delivering sufficient power to the train by means of the ordinary trolley wire. This difficulty does not apply in the case of third-rail roads or the single-phase a.c. road. Where bulk freight is to be handled in quantities on an electric road, it is just as necessary to keep down to a low grade as in the case of a steam road. The co-efficient of tractive resistence in the case of a 10-car freight train at 15 miles per hour, and on level track is only some 7 or 8 lbs. per ton; where, on the other hand, each 1 per cent. of grade adds 20 lbs. per ton; that is, on a 1 per cent. grade the tractive resistance is perhaps 27 lbs. per ton, or nearly four times as great as that on a level track. Freight service, therefore, demands low grades so as to keep down the cost of locomotives, of power house, sub-stations, and line equipment.

The consideration of the route may start with the principal terminal city, and it is of great importance to have the terminal station in such city well located relative to the retail district, which is generally also the amusement center. Generally interurban roads entering a city of any considerable size use the tracks of the local street car system, but sometimes it is possible to obtain an independent entrance, and, when finances warrant it, this is preferable. It is, however, seldom warranted unless the anticipated travel is considerable, and, of course, is materially affected by the cost of construction required in the city, including the cost per mile and total mileage, which includes the first cost and the maintenance of street paving, sprinkling charges, if any, etc., and city taxes.

In a general way, the shorter the route in the city, or more correctly, the less the time of the run in the city, the better for the interurban railway. This materially depends on the frequency of service given by any competing steam road and by the time required between the station of the steam road and the retail center, not only in the principal terminal city, but also in the principal towns along the route. For example, on a new road which is being built a large amount is being spent in order to reduce the time required in the principal city, because the competitive steam railroad service is very frequent, there being two competitive steam roads, each operating trains hourly. In a case where the competition is four or five trains each way daily, most of which are through trains, generally one or two hours late and only stopping at two points along the route other than the principal city, it is not advisable to make large expenditures in order to save a small amount of time.

Another point is the location of the road in cities and towns along the route. The receipts of an interurban line depend largely on the accessibility of its cars and frequent service, but, on the other hand, accessibility in the cities and towns generally means somewhat increased first cost, also a longer time for the run. If freight cars are to be handled it means considerable additional trackage for the freight line. The recent development of the alternating current motor system makes it desirable for roads which use this system to keep on private right of way as much as possible, and when in cities and towns to use only such streets as will allow the use of high voltage trolley. As a matter of fact the high voltage trolley is now used in some towns of considerable size, but it is hardly probable that this will be permitted in all towns.

The number of stops made by a car has a very decided effect on the size of motor necessary to drive it, and with any given schedule and car the less the number of stops the smaller and cheaper the motor equipment. Taking a given car geared to a maximum speed of 40 m.p.h., with eight stops per mile, the possible schedule speed is less than 10 m.p.h. With four stops per mile the possible schedule is less than 15 m.p.h. With two stops per mile the schedule speed is about 20 m.p.h., and with one stop per mile the schedule speed is about 26 m.p.h. On the other hand, with one stop in eight miles a schedule speed of 34 m.p.h. can be made. This is on a level and straight road. Had the same car been equipped with motors geared to but 30 m.p.h., it would have been made with eight stops per mile a schedule speed of eight m.p.h., which is practically the same as before; with four stops per mile it would have made a schedule of 13 m.p.h.; with two stops per mile a schedule of 17 m.p.h. The schedule will not only be as good as that made with higher gearing, but also the motor equipment can be decidedly smaller and cheaper, and the fluctuation of load at the power house will be much smaller than that resulting from the higher speed car.

Unless grades are considerable, the advantage of grade reduction, as far as time is concerned, will generally be found small and not comparable with lessening the number of stops. For example: In one case we prepared a preliminary estimate of the cost of the grading required to obtain a maximum 1, 1½ and 2 per cent. grade through a country rolling the entire distance, and the time which would have been saved by reducing from 2 per cent. to 1 per cent. was not greater than a reasonable allowance for time lost in the principal city on account of delays in the congested district; whereas, the additional cost required for the reduction of grade would be very considerable.

Since the single-phase a.c. motor has become an accepted fact, it is in some cases advisable to consider plans and to make estimates of cost based both on d.c. and on a.c. equipment. The general characteristics of the single-phase a.c. road, as compared with d.c., are low first cost of line and substation equipment, high first cost of car motor equipment, and ability to deliver power either to many small units or to a few large units, and in either small or large blocks. The characteristics of the d.c. equipment are high first cost of equipment of substations and line, low cost of car equipment, and considerable cost for substation attendants, and ability to deliver power to a considerable number of units in small blocks, but requiring much greater investment than d.c., when required to deliver large quantities of power to a small number of units. As a result the a.c. system is more especially adapted to the interurban roads where first cost must be as low as possible and where the number of cars operating is comparatively small, and also to the operation of trunk lines, freight roads, etc., where there are a small number of heavy trains to be moved, and therefore, in a general way, for "interurban roads in sparsely settled districts." On the other hand, the d.c. equipment is preferable for the city road, the elevated road and the suburban roads with heavy traffic, where the number of trains is large. The interurban road which is equipped with the single-phase trolley is in a position to handle freight in large units to much better advantage than the road having d.c. equipment, as it is not limited as to the amount of power which a trolley wheel can take from the wire, but only as to the maximum load which the sub-station can carry; and in this case the sub-station equipment is comparatively cheap, it is possible to have a sufficient sub-station capacity to handle heavy freight in addition to the passenger service.

Some interurban electric railroads should never have been built, as under no conditions were they warranted. Others have been improperly designed. In some cases the construction has been too expensive and in other cases too cheap. Other roads have not been properly maintained, and still other roads have not been properly managed. Success depends on obtaining the best location, proper design under the special conditions, proper construction and competent operation. The first three are to a large extent unchangeable once the road is built.

Block Signal Costs on the Pennsylvania Railroad.

The block signal installations made by the Pennsylvania Railroad in the three years 1904-5-6 aggregate nearly 1,500 miles. The cost was $830,451 and $191,758 was added to the annual operating expenses. The Pennsylvania now has every mile of its main lines protected by block signals, and all but about 500 miles of the entire mileage (6,032 miles) east of Pittsburgh and Erie. The details by divisions are shown below (cents omitted).

BLOCK SIGNALS INSTALLED EAST OF PITTSBURGH AND ERIE, YEARS 1904-05-06.

Division.	Mileage of road.	Number of tracks.	Cost of installation.	Addition to annual op. expenses.
Automatic Block Signals.				
New Jersey	.....	..	.....	.....
Eastern Pennsylvania	14.9	4	$119,285	$12,786
Western Pennsylvania	29.83	4	126,240	5,764
Buffalo & Allegheny Valley	1.0	2	2,122	.....
Erie Division & N. C. Ry.	.....	..	.....	.....
Phila., Baltimore & Washington	24.2	1, 2 & 4	111,736	9,900
Philadelphia Terminal	2.73	2	8,346	.....
West Jersey & Seashore R.R.	35.63	2 & 3	273,186	22,960
Total	108.29	..	$640,915	$51,411
Telegraph Block Signals.				
New Jersey	10.8	1 & 2	$3,396	$1,800
Eastern Pennsylvania	34.67	2	28,910	24,374
Western Pennsylvania	68.7	2	25,260	13,004
Buffalo & Allegheny Valley	350.0	1 & 2	55,421	28,489
Erie Division & N. C. Ry.	897.45	1 & 2	49,462	48,529
Phila., Baltimore & Washington	61.96	2	12,635	16,083
Philadelphia Terminal	.....	..	.....	.....
West Jersey & Seashore R.R.	28.91	2	14,449	8,066
Total	1,452.49	..	$189,535	$140,346
SUMMARY.				
Automatic Block Signals.				
Two-track sections	3.73	..	$10,468	.....
Four-track sections	44.73	..	245,525	$18,551
Mixed	59.83	..	384,922	32,860
Total	108.29	..	$640,915	$51,411
Telegraph Block Signals.				
Two-track sections	194.24	..	$81,255	$61,527
Mixed	1,258.25	..	108,279	78,819
Total	1,452.49	..	$189,535	$140,346
Total, automatic and telg.	.....	..	$830,451	$191,758

It will be noted that in the case of the automatic signals the

annual operating expenses equal only about one-twelfth of the cost of installation, while with the telegraph block system the yearly operating expenses equal about nine-twelfths of the first cost.

We do not know what items are included in operating expenses, but assuming that depreciation is included, and that capital is worth 6 per cent. per annum, a rough calculation of the yearly cost per mile may be made as follows: Automatic, expenses, $51,411; interest, $38,455; total, $89,866, or about $830 per mile of road. Telegraph block system, expenses, $140,346; interest, $11,372; total, $151,718, or about $104 per mile of road. It is to be borne in mind that about half of the automatic mileage consists of four-track line. The telegraph block system is largely single-track, and, by reason of the longer block sections provides only for a traffic far less dense than that carried by the lines equipped with automatic signals.

Co-efficients of Friction Between Wheels and Rails.*

BY GEO. L. FOWLER.

(Reprinted from a volume of reports made to the Schoen Steel Wheel Co.)

The resistance of a wheel to slipping on the rail depends upon two causes frequently confused, but which are to be considered separately. These are friction and abrasion.

Frictional resistance is due to the roughnesses of the two surfaces in contact, and may be compared to the lifting of the weight to be moved over the successive inequalities of the surface on which it rests. Abrasion, on the other hand, involves the removal or cutting away of the particles of the masses in contact. The slipping of a wheel, such as would produce a flat spot, involves both frictional resistance and abrasion. If there were no slipping of the wheel on the rail there would be no wear, provided the rolling action did not produce sufficient pressure on any one point to crush the metal or cause it to flow. But there is always more or less slip even on a straight line.

There are two kinds of slipping to which car wheels may be subjected. One is the skidding action due to the locking of the wheels by the brake-shoes. The other form occurs when the driving wheels of electric motor cars, for instance, are turned faster than the corresponding rate of motion of the car and the whole periphery of the wheel slides over the rail. In order to determine whether the resistances to these two kinds of slipping were the same, certain experiments were made.

The apparatus was designed to produce, as nearly as possible, the actual conditions of track work.

Two pieces of steel rails of 75 lbs. section, one of which had been worn smooth in service; the other, a piece of new rail, together with a section of a steel wheel and a section of a cast-iron wheel, with the treads of both smooth and free from imperfections, were used for the tests. The testing machines were made by Tinius Olsen & Company, one with a capacity of 100,000 lbs. and the other a capacity of 50,000 lbs.

The apparatus is shown in the accompanying illustrations for the skidding movement. The wheel section was set on the rail and loaded by the 100,000 lbs. capacity machine. It was then slipped over the rail by a pull on the connection rod reaching to the other machine which measured the amount of the pull required to slip the wheel on the rail.

In loading the wheel, the pressure was applied through a plate resting on two rollers. In this way the friction, except that between the wheel and the rail, was reduced to practically nothing.

For the spinning motion, the bearing plate above the rollers was made convex and the bottom plate resting on the top of the wheel was made concave; both surfaces being concentric with the tread of the wheel. A pull on the wheel, therefore, caused it to roll under the bearing plate as though it were revolving on its own center. The arrangement of this is clearly shown in the diagram.

The force required to move the wheel on the rail was weighed by a bell crank with a knife edge bearing, resting on a heavy casting attached to the bed plate of the small testing machine. The vertical arm was attached to the pull rod and the end of the horizontal arm had a bearing on a wedge or knife edge that was forced down by the platen of the machine.

The wheel section was placed in position on the rail and weighted with a predetermined load. Pressure was then applied to the wedge on the small machine. This pressure was transferred through the bell crank as a pull on the connecting rod. When slipping occurred, the event was marked instantly by the drop of the beam of the small machine. The movement of the wheel over the rail usually amounted to about $^1/_{32}$ in. As the object of the investigation was to determine the friction at rest no attempt was made to measure the pull after the first slip occurred. This was markedly less than that required to start the movement from a state of rest.

Separate tests were made with steel and cast-iron wheels on the old and new rails, for both the skidding and spinning motions. In loading the wheels, the weights were increased by regular increments of 2,000 lbs. up to 30,000 lbs. Three tests were made with each loading and for each condition of wheel movement. The average of the three tests in each case is given in the accompanying table.

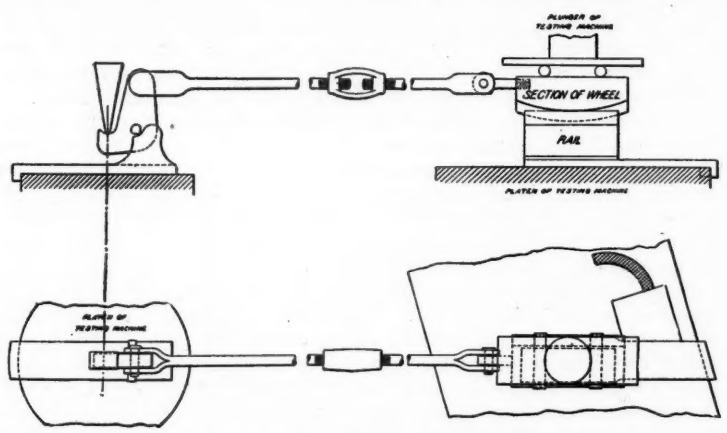
There was so little difference in the pull required to slip the wheels on the old and new rails that an average of the results obtained is given as the resistance to spinning and skidding of the two wheels on a steel rail.

Coefficients of Friction Between Wheels and Rails

Load on wheel.	Kind of motion: Spinning		Skidding	
	Steel wheel.	C.-i. wheel.	Steel wheel.	C.-i. wheel.
2,000 lbs.	.259	.243	.285	.287
4,000 "	.240	.215	.254	.259
6,000 "	.234	.208	.245	.254
8,000 "	.228	.206	.246	.242
10,000 "	.215	.204	.238	.233
12,000 "	.212	.205	.237	.223
14,000 "	.207	.199	.233	.226
16,000 "	.204	.196	.232	.219
18,000 "	.204	.198	.231	.219
20,000 "	.201	.194	.236	.220
22,000 "	.205	.191	.238	.223
24,000 "	.204	.192	.235	.224
26,000 "	.205	.189	.232	.223
28,000 "	.203	186	.236	.217
30,000 "	.203	.183	.234	.214

The table shows that the resistance to spinning of the steel wheel is somewhat greater than that of the cast-iron wheel, a fact which is brought out quite forcibly by the coefficients of friction, in which the coefficient of the steel wheel is invariably higher than that of the cast-iron.

It also appears from this table, that the coefficient of friction of the steel wheel decreases as the load is increased, up to a pressure of about 15,000 lbs., after which it is practically constant. The coefficient of friction of the cast-iron wheel decreases rather rapidly, like that of the steel wheel, up to a load of 15,000 lbs.,



Arrangement of Apparatus to Test the Frictional Resistance of Car Wheels to Skidding.

after which it falls away slowly, though a tendency to decrease with the increase of load is manifest.

As regards skidding, the values of the coefficients of the two wheels bear the same relation to each other as they do for spinning. The coefficient of resistance is greater for the steel wheel than for the cast-iron wheel; and there is the same falling off in the value of the coefficient as the load is increased up to about 15,000 lbs. after which that of the steel wheel is nearly constant, while that of the cast-iron wheel continues to fall away slowly. It would be difficult to explain these phenomena without the data obtained in the investigations previously described, made to determine the area of contact between the wheel and the rail, and the relative rate of abrasion of the steel and cast-iron wheels on the emery wheel. The results of those investigations also serve to explain why the coefficient for a skidding wheel is higher than the coefficient for a wheel that is spinning.

In the case of the cast-iron wheel, it was shown in the preceding chapter that the imposition of a heavy load caused a breaking down of the metal in the rail at a certain point, while no such failure occurred with the steel wheel under the same load. The cast-iron wheel being rigid, inelastic and incompressible on the tread, was forced down into the metal of the rail, causing the rail to do all of the yielding needed to produce the area of contact obtained; with the result that it was soon compressed beyond its elastic limit and given a permanent set. The steel wheel yielded as well as the rail, thus relieving the rail of a part of its compression and increasing the area of contact. This behavior of the two wheels explains, in part, the results obtained in these tests. In addition, it must be remembered that the normal coefficient of friction is greater between steel and steel, than it is between cast-iron and steel.

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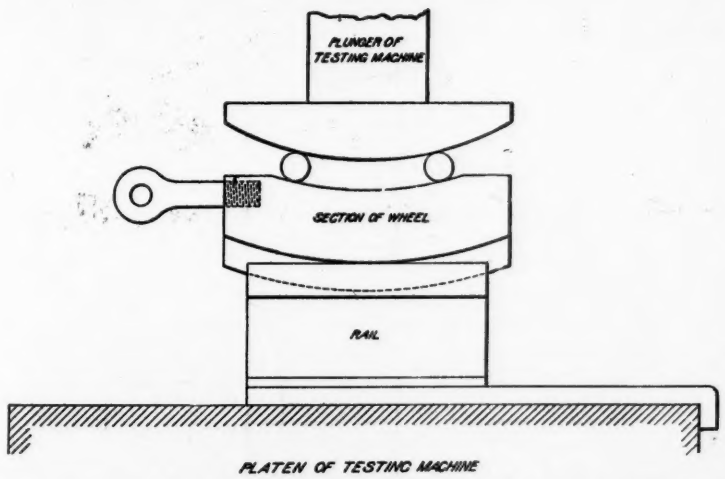
When the cast-iron wheel is loaded on the rail, it indents the rail in proportion to the pressure applied, without being distorted itself. If, then, it is turned, as by a motor, it simply revolves in the concave depression in the rail, without undergoing any deformation itself and with no resistance other than that of overcoming the friction between the surfaces of the wheel and rail. The steel wheel, on the other hand, is itself compressed, as well as the rail, so that when it is turned a continuous progressive compression of the tread is set up, equal to the amount of the original compression. Hence, the resistance to turning will be equal to the frictional resistance plus that set up by this compression.

It was shown that the cast-iron wheel was cut away much more rapidly under the emery wheel than were the steel tires and wheels. In the tests for skidding, the loads were successively applied without readjusting the wheel on the rail, with the result that the steel wheel was skidded about 1¼ in. and the cast-iron wheel about 1 in. This was done under loads increasing from 2,000 lbs. up to 30,000 lbs. Under this treatment, the steel wheel developed a slid-flat spot about $^{9}/_{16}$ in. long, and the cast-iron wheel a spot about ⅞ in. long. In both cases the rail was spotted and the metal was rolled up in folds, indicating the direction of the motion of the wheel. The piece of rail used with the steel wheel was spotted for a distance of about 1¾ in. while the piece used with the cast-iron wheel was spotted for a length of about 1½ in. This abrasion of the cast-iron wheel probably accounts for the lower resistance to skidding as compared with the steel wheel. For the same weight and for the same distance of skidding, the amount of metal abraded from the cast-iron wheel was in almost exactly the same ratio to that removed from the steel wheel, as is shown in the diagram of abrasion tests.

It will be remembered that, for the lower wheel loads, the



Arrangement of Apparatus for Testing the Frictional Resistance of Car Wheels to Spinning.

investigation of contact areas showed that there was comparatively little difference between the areas obtained with cast-iron wheels and with steel wheels, and that it was inferred that the total compression of the metal was approximately the same in both cases. Under these circumstances it would be expected that, if the power required to distort the metal of a steel rail and tire were the same, the resistance to skidding of the steel wheel and the cast-iron wheel would also be the same. But, owing to the more rapid abrasion of the cast-iron wheel, as soon as it begins to skid it wears, and, by thus increasing the area of contact, it lessens the depression of the rail, decreases the amount of metal to be distorted, lowers the resistance to the motion, and makes the coefficient of friction of skidding less on the cast-iron wheel than on the steel wheel.

This depression of the rail due to the imposition of the wheel load accounts for the higher coefficient of friction obtained with a skidding wheel than with a spinning wheel. With a wheel spinning, there is no continuous deformation of the metal of the rail to be affected. In skidding, there is a depression of the rail to be carried forward like a wave, which naturally raises the resistance and makes the coefficient greater than where slipping over one spot alone takes place.

While it is not safe to draw rigid conclusions from the limited amount of data obtained, it does appear that inasmuch as the steel wheel offers greater resistance to spinning it is better adapted for use as the driving wheel of an electric car than the cast-iron wheel; and further, its higher coefficient of friction renders it less liable to skidding.

This matter of wheels skidding, with the consequent development of flat spots on the tread, was considered of enough importance to warrant further investigation.

It has been noted by many other investigators that steel wheels do not flatten as readily as cast-iron wheels. By some this is attributed to the fact that small flat spots, once formed on the tread of a steel wheel may be rolled out, whereas they have a tendency to grow larger on cast-iron wheels. The abrasion and skidding tests which have been made seem to show, however, that it is the lower resistance to grinding of the cast-iron wheel that accounts for the more rapid development of these flat spots.

To briefly recapitulate, these tests showed that the rate of grinding of the first ⅛ in. below the tread was about 4.64 times as fast in the cast-iron wheel as in the Schoen steel wheel. For the second ⅛ in. the ratio became 6.37, and for the third ⅛ in., 15.93, showing the rapid decrease of wearing resistance of the cast-iron wheel below the surface. In the skidding tests in the laboratory, the effects were confined to the metal close to the surface and it was found that, with the same amount of skidding, the amount of metal removed was about 5.12 times as great on the cast-iron wheel as on the steel wheel. A further check on these figures was afterwards obtained by taking the time required to remove approximately the same amount of material from the treads of cast-iron and steel wheels in a wheel grinding machine. It was found that it took from four to five times as long to grind down the steel wheels as it did to grind the cast-iron wheels. In all of the foregoing investigations, the metal of the wheel under test was kept cool, either by a stream of water or by doing the work so slowly that natural radiation counteracted the tendency to heat and the temperature of the metal was not raised above 100 deg. Fahr.

For the purpose of ascertaining whether the results of these investigations were comparable with the results obtained in actual railroad service, when the wheels were locked and skidded under a car, series of tests were made by skidding the wheels under a loaded car.

Through the courtesy of the New York, Ontario & Western a piece of track and a suitable box car were supplied for the tests. One pair of wheels and axle were removed from under the car, and replaced by an axle on which a Schoen steel wheel and a new cast-iron wheel had been pressed. These wheels were 33¼ in. and 33 in. in diameter, respectively. This pair of wheels was placed at the end of the car, and was fitted with two brake-beams, so that twice the usual brake-shoe pressure could be applied on the wheels. By this means, the wheels could be held in a fixed position throughout a run. But it was more difficult to hold the wheels at low speed than at high speed.

The car was loaded until the weight on the pair of wheels to be tested was exactly 24,000 lbs. The car was then hauled back and forth over a piece of track 1,850 ft. long. The brake was set and the wheels skidded for the whole distance. The car was hauled at two speeds, namely, three and 12 miles an hour.

When the car was hauled at a speed of three miles an hour, flat spots were made on the steel wheel in area about .30 in., while the spots formed on the cast-iron wheel were in area .80 in. These areas correspond to diameters of about ⅝ in. and 1 in. respectively, though the spots on the cast-iron wheel were elongated to about 1⅛ in., which indicated somewhat more metal removed. The volume of metal abraded from the cast-iron wheel was about 5¾ times greater than that from the steel wheel.

While the movement was slow the wheels remained cool. But when the speed was increased to 12 miles an hour, heating took place and the cutting was more rapid on the steel wheel.

For the first 1,850 ft. run the areas of the flat spots produced at a speed of 12 miles an hour averaged 8.125 sq. in. on the steel wheel and 4.445 sq. in. on the cast-iron wheel. The estimated amount of metal worn away was 4.63 times as much with the steel wheel as with the cast-iron wheel.

When the skidding was continued the rate of wear increased very rapidly with the cast-iron wheel, while there was little increase with the steel wheel. At the end of the run of 3,700 ft., the area of the flat spot on the steel wheel was 8.43 sq. in., an increase of .305 sq. in., while the area of the spot on the cast-iron wheel was 5.72 sq. in., an increase of 1.275 sq. in. From this it appears that the cast-iron wheel wore away more rapidly than the steel wheel after the hard surface metal had been broken through.

The indications are that in skidding a short distance at low speed a cast-iron wheel is more apt to develop a flat spot than is a steel wheel. On the other hand, if the skidding continues for some distance at a high speed, the wheel becomes heated and then the steel wheel is the first to yield, unless the surface chill of the cast-iron wheel has already been worn through.

The General Manager of the Swedish State Railroads, Sahlin, has resigned, and will retire at the end of the year. He had held the position only two years, during which the system of administration of the State Railroads was greatly changed. He is to be succeeded by F. W. H. Pegelow, who is now manager of a private railroad, but has been in the State Railroad service before. Sahlin had a legal education and his career has been in the government service, being telegraph manager when appointed railroad manager.

Pegelow is an engineer, and was for a long time locomotive superintendent of the State Railroads. He was for several years a member of Parliament. As Assistant General Manager V. Klemming has been appointed. He has been at the head of the State Railroad department of locomotives and shops, and is widely known on the continent as a mechanical engineer.

The Bush Terminal Company.

The cost of moving freight long distances has been steadily decreasing for many years, larger ships, locomotives and cars having cheapened the cost per ton of long-haul transportation. Methods of handling freight for short distances have not, however, been much improved. Labor costs more now than before and so the cost of cartage is higher than ever. The ideal terminal aims to do away with as much hand labor as possible. Freight is carried by land or water to a terminal; it is then unloaded and left in store until the consignee wants it. When that time comes, the consignee may have it carted direct from the storehouse to destination, which, as far as he is concerned, is his stock-room or any other point from which he delivers goods to the final purchaser. On the other hand, he may decide to reship the goods; in either case some one has to pay the cost of carrying them from the railroad or steamship terminal to the storehouse and from the storehouse to some other place. To avoid as much as possible this expensive handling, the terminal should provide in itself receiving facilities, storage room and shipping facilities. To perform these three functions is more and more difficult the larger the city which the terminal serves. In a small town reached by one railroad there is no problem. When a competing railroad builds through the other end of the town there results on a small scale, all the difficulty which large cities have to deal with. Some of the big interior cities have built union terminals having direct rail connection with all roads entering the city. Cupples Station, at St. Louis, is perhaps the best known example. This terminal consists of a system of warehouses each served by a spur track, the different merchants being tenants of the warehouses. A car is run into the proper building and lifted on an elevator to the floor where the consignee has storage room and there unloaded. If the freight is to be reshipped out of the city by railroad an empty car is brought up to the door and reloaded so that the whole process requires only two handlings of the freight.

Such a terminal is impossible in New York City. There is no spot where a terminal could be erected with all-rail connection with every railroad except at such enormous outlay of capital as to be prohibitive. Most of the railroads reaching the city have individual rail terminals on the west shore of the upper bay and freight terminals on the water front in Manhattan. Cars are carried to the freight terminals on car floats and there unloaded. The freight goes into storage, sometimes being carried on drays for long distances through congested streets, and when it is removed from the storehouse has to be carried in the same slow and expensive manner to another terminal or to destination.

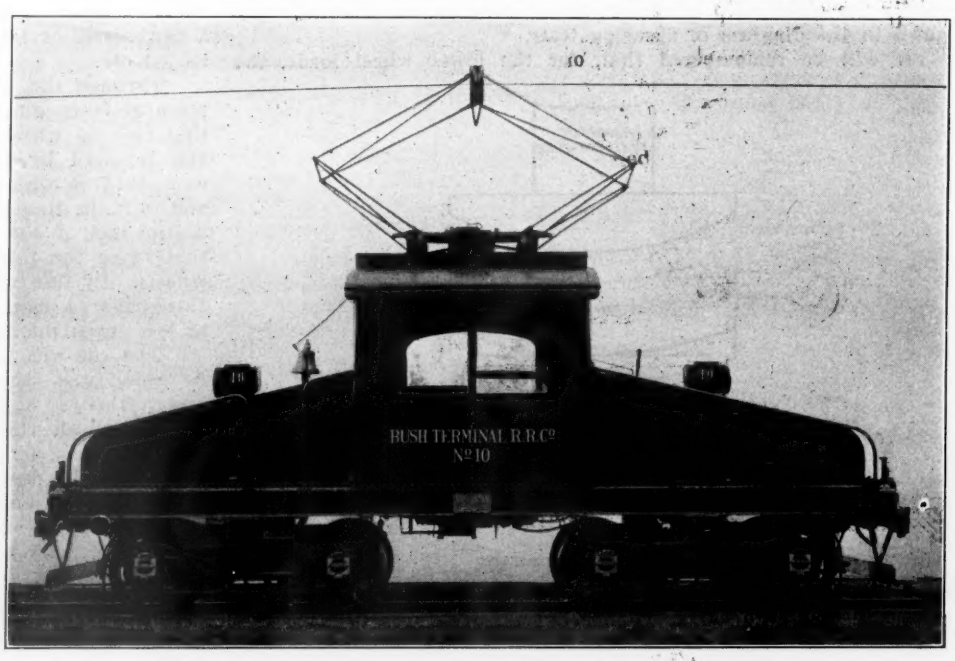
The Bush Terminal is in South Brooklyn on the east shore of the upper bay. It does three distinct kinds of business, but the operation of each of them is made more efficient by the proximity of the others. It is designed to decrease the cost of local handling by the economies possible through concentrating the different stages. It is a deepwater terminal for freight steamships, it stores freight and it operates a terminal railroad.

The company acts as terminal agent for the following roads: The Baltimore & Ohio, the Central of New Jersey, the Delaware, Lackawanna & Western, the Erie, the Lehigh Valley, the New York Central & Hudson River, the New York, Ontario & Western, and the West Shore. On lighterage business it is paid so much per ton, while on yard business it is paid various rates according to the classification of different kinds of freight. The net earnings from this business are comparatively small.

The Pennsylvania Railroad, in conjunction with the Long Island, will have its own complete system of terminals, but when the yard improvements of the Long Island at 65th street are finished, the Bush Terminal Railroad will connect with it and in that way, through the New York Connecting Railroad, have direct rail connection with New England roads.

For the accommodation of freight steamships, the company has six covered piers now, and is planning a seventh. These piers are all of the same general design. They are 1,340 ft. long and 150 ft. broad, with 270 ft. water space between piers. They are built on piles within which crib work is built, and the enclosed space filled with sand dredged in making the channel and deep water along the side. The framework is iron and is covered with wood. The system of fire protection is by sprinklers installed on the piers, though it is more carefully worked out in the warehouses. The piers are leased to steamship companies, and have been partitioned off according to the needs of the lessees, since often one company does not need the whole of the pier but only enough of its length to accommodate one or two boats. As the accompanying plan shows, each division of a pier is served by a separate spur track, which runs along the north side of the pier with a switch opening into each division. The partitions are of corrugated iron, and the openings in the partitions can be closed by a metal curtain in case of fire. The most northerly pier, No. 7, is to be remodeled, and pier No. 1 will be built soon.

The freight storing facilities are of three kinds. The most interesting are the lofts, which, as shown in the accompanying plan, are on Second avenue north of 37th street. So far two have been built and work is under way on the third. The first two lofts are entirely occupied and half of the space in the third has been contracted for by tenants; the rest is mostly under consideration. While these lofts may be used as factories, most tenants use their space as stock-rooms. Each building is six stories high and has 300,000 sq. ft. of floor space. Electric current for light and power is delivered to the lofts at 220 volts pressure. Steam for heating, and power in case the tenants install steam engines, is carried from the terminal company's power house in 12 in. x 8 in. mains. It is



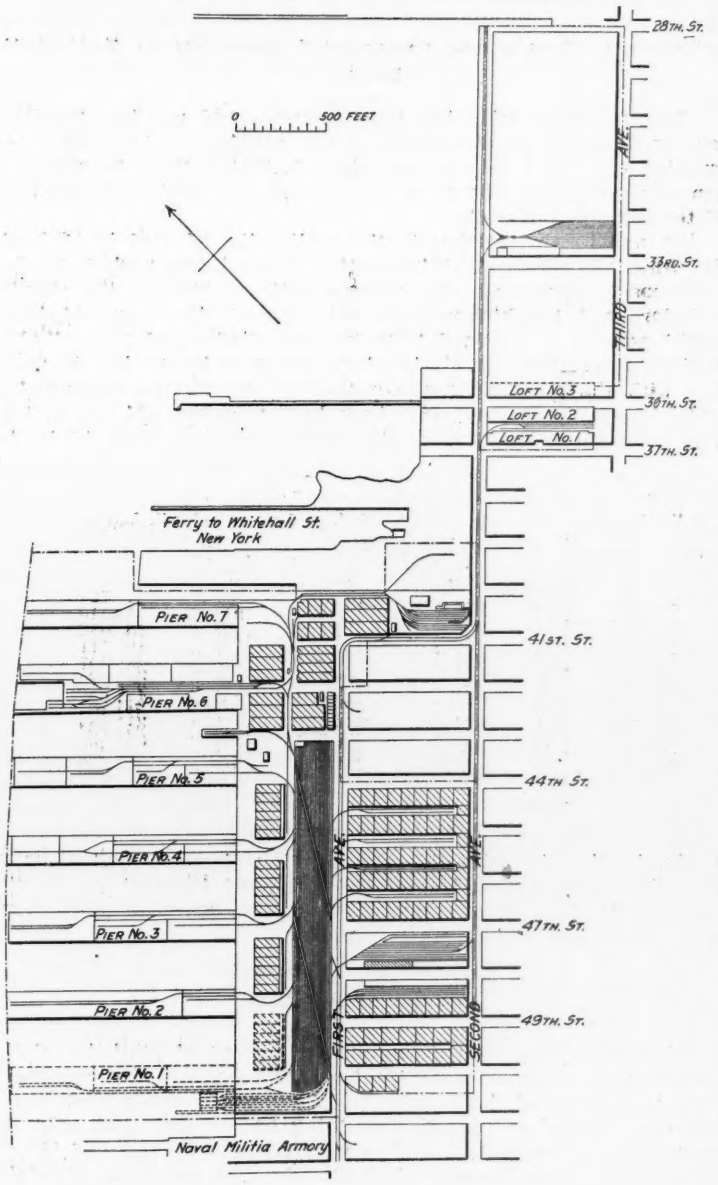
Electric Switching Locomotive; Bush Terminal Railroad.

delivered to each floor at 110 lbs. pressure. In each building are four electric elevators of three tons capacity. These buildings are also equipped with sprinklers. A shipping platform extends along the entire length, 600 ft., on one side of each building. When a freight car comes alongside, the floor of the car is on a level with this platform. On the other side of the building is a similar platform or doors to which the trucks come. All the space in the first two factories has been rented to tenants, who use the space either for storage or for manufacturing purposes. The company plans 18 buildings like these, which will take up all the space from 37th to 28th streets. They are being built at the rate of about one a year.

Directly behind the piers are 62 of the warehouses; these particular structures are for high grade freight. Each is six stories high, some are of mill construction and others are of reinforced concrete. The brick buildings are fireproof so far as such structures can be, and there is an automatic sprinkling system in each warehouse, so that the insurance rates are exceptionally low. A portable electric hoisting machine is used for slinging bales and cases up to the upper floors of these buildings. Behind this group of warehouses is the main yard, which has a capacity for 1,000 standard freight cars. As can be seen on the plan, tracks from the yard run behind each block of warehouses for loading, others run down to the factories, and a line of tracks runs to the present car-float transfer bridge between piers 5 and 6. A four-track transfer bridge is to be built, as indicated, just south of the proposed pier No. 1. About 200 cars a day are handled on the car floats. Behind the main yard are the rest of the 121 warehouses; these are for low grade traffic, mostly cotton, and are one-story structures. Concrete roadways run between every two blocks of

the houses for the use of trucks. Very little of the higher grade freight is distributed to destination or brought from destination by other means than railroad. One of the secondary freight yards is between 47th and 48th streets. This is used for local and less than car load business. The yard between 41st and 40th streets is a transfer yard only. Between 32d and 33d streets another local freight yard is being built. The freight house at this point is finished but will be used for storing construction material until the yard is in operation.

The company owns three tugs, five car-floats, four covered lighters, three open lighters and two steam lighters. It has five steam locomotives and two electric locomotives. The first electric locomotive was built by the General Electric Company about three years ago. The second has just been finished by the General Electric Company and the American Locomotive Company jointly. The accompanying photograph shows this engine. The truck construction differs from that ordinarily used for electric motor trucks. It follows rather a type which has been used with success for tender



Plan of the Bush Terminal.

and leading trucks of steam locomotives. The bolsters are carried rigidly on the side frames, and the weight of the frame and bolster is transmitted to the equalizers through one semi-elliptic spring on each side instead of through bolster springs and helical side springs, as in the M. C. B. equalized truck. The driving axles are 6 in. in diameter and are of forged steel, with 36-in. fused steel-tired wheels. Each truck is equipped with two GE-55-A (90 h.p.) two-turn motors, with a gear ratio of 52 to 21. These motors with this gearing will give at their one hour rating a tractive effort of 3,000 lbs. per motor, or 12,000 lbs. per locomotive, at a speed of about 18 miles an hour.

The cab is built of sheet steel, supported by a framework of small angles. There is a main operating cab and sloping end cabs, with narrow side platforms extending from the main cab to the ends of the locomotive. The floor of the locomotive is ⅜-in. sheet steel, but in the main operating cab this is covered with a ¾-in. wood flooring. The arrangement of apparatus in the cab is shown in another photograph. The locomotive is equipped for both straight and automatic air. In the center of the main cab is a Cp-23 air compressor, having a capacity of 50 cu. ft. per minute. In the operating engineer's corner is located a C-6 master controller and the valves and handles for operating the combined straight and automatic air. In the end cabs are a sand box, air drum, contactors and rheostats. As the locomotive is to be used solely for switching service, it has a pantagraph trolley instead of the ordinary wheel trolley, which has to be swung around when the direction of the engine is reversed.

The locomotive is equipped with bell, whistle and headlights. The headlights have 32 c.p. incandescent lamps, and lamps for illuminating gages are wired on the headlight circuit and controlled with the same switches. The locomotive is 29 ft. long over bumpers, 11 ft. 9 in. high over cab, the rigid wheel base is 6 ft. 6 in. long and the weight on drivers is 80,000 lbs.

M. H. Smith on Excess of Traffic Over Facilities in Alabama.*

Although the interests of the shipper and consignee seem to be identical, the two do not always co-operate. To illustrate, a lumber manufacturer ships to a customer, possibly a commission merchant, a car which is not unloaded, and for that reason the manufacturer is unable to secure additional cars and is oftentimes greatly embarrassed and suffers a heavy loss. This is no way seems to concern the party at fault, although he may be directly affected by the failure of the millman to secure cars in which to make additional shipments. In cases where the shipper and consignee are the same, as in the case of a shipment of ore, limestone, coal or coke to a furnace, the carrier is in a position to enforce the prompt unloading because, if the owner fails to promptly unload, he does not secure cars in which to load additional material. This brings operations to a standstill, and he will, therefore, arrange to promptly unload the cars.

As an illustration of the difficulties under which the carrier labors, take the conditions that existed last winter at Mobile, which is a large export shipping port, especially of lumber. If lumber is sold for export to be reshipped at a somewhat indefinite date, depending upon the arrival of a vessel, the consignee, to avoid the expense of unloading and storing, desires to keep the property on cars until the vessel arrives. The accumulation during the month of July and August, 1906, was very great. This was aggravated by the storm in September, 1906, and conditions became desperate. The facilities of the Louisville & Nashville were so overtaxed that it became almost impossible to place cars to be unloaded for consignees who were prepared to promptly unload, and, in fact, the movement of through freight traffic was seriously interfered with and threatened with paralysis or stoppage. At the same time, the manufacturers of lumber were in great distress because of the inability of the company to furnish cars for other shipments, not only to Mobile, but to all other points.

A statement was prepared showing the numbers of the loaded cars on hand at 7 o'clock a.m. December 15, 1906, and the length of time they had been on hand. It was found that of the total of 193 cars of lumber, 52 had been on hand prior to December 1, 1906, some of which were received in October, or had been on hand 52 days. Of all classes of property, there were 524 carloads that had been held from 3 to 60 days. On December 29, 1906, another check was made of loaded cars that had been on hand December 15, 1906, which showed that 33 of such cars were still on hand undelivered. To relieve the situation, the management was compelled to adopt arbitrary measures—temporarily stop the shipment of some classes of property to Mobile, and, in some cases, to unload and store oil cake and lumber. During all this time, many shippers, especially manufacturers of lumber, were in distress because they could not get cars.

The conditions that have prevailed at Mobile are typical of those over the entire Louisville & Nashville system. The business of many consignees has outgrown their facilities for promptly receiving and handling all of the property the increased business requires, and thus renders it difficult for them to promptly relieve the cars.

The reasonableness of making a just and lawful charge for the storage of property in cars which the consignee fails to promptly unload is so manifestly in the interest, not only of the carrier, but of its patrons, that it is conceded—is not denied.

Let us now consider the relations between common carriers and shippers. It is the duty of a common carrier to transport property to the extent of its facilities, for all who may desire to have property transported, upon equal terms. It must provide facilities for receiving, caring for, and forwarding property to destination. When, by the terms of the transportation contract, the shipper is to load the property, cars must be furnished to enable him to do so; but

*From a statement to the committee of the Alabama legislature on Commerce and Common Carriers, in regard to reciprocal demurrage.

a carrier can only be equitably, and, I think, lawfully required to provide facilities for normal traffic—cannot be required or compelled to furnish facilities beyond its ability or capacity. A carrier having equipped himself with a vehicle moved by one horse for the movement of a limited traffic, cannot be required to handle traffic requiring a vehicle moved by four horses. A railroad constructed and equipped for handling a limited local traffic, with a single track, adverse grades and curves, cannot be required to furnish two, four, or more tracks, or the facilities furnished by railroads in some parts of the country operating four, and sometimes eight tracks, over grades where a single locomotive may move 3,000 tons against a load on the inferior single-track road of 300 tons.

Take the South & North Alabama Railroad as an illustration. It is a road originally built with limited capital, through a rugged country, across drainage, and when opened for traffic there was not a community of 100 persons on the line between Montgomery and Decatur. The alinement is crooked and the grades excessive, equivalent to more than 80 ft. to the mile. The heaviest locomotive in use, having a tractive power of 35,000 lbs., can move but 740 train tons.

A double track has been built from Black Creek to Oxmoor, a distance of 14.6 miles, from Decatur to Flint, 5.4 miles, from Calera to Hardy, 12.6 miles, and numerous passing tracks have been created. In addition, large expenditures have been made to provide increased terminal facilities at Decatur, Birmingham, (Boyles), Montgomery, etc. Nevertheless, the traffic now pressing is greater than can be moved, and if the present volume of traffic is to be continued and increase, it will be necessary to reconstruct the line, reduce grades and curvature, lay second tracks, increase the equipment, and construct shops and other facilities. The cost will be very great. The work of reducing grades and laying second track between Oxmoor, Ala., and Hardy, 14.41 miles, has been begun, at an estimated cost of $1,010,500. I roughly estimate that to reduce grades and curvature, and build second track over the entire line, Montgomery to Decatur, with the necessary increase in equipment, shops and terminal facilities, will cost not less than $15,000,000, and, under existing conditions, the work could not be completed in less than five years. Under the existing financial conditions, the money cannot be provided, and after the expenditure of the money already provided, and the work undertaken is completed, the remainder of the work cannot be entered upon unless there is a favorable change in financial conditions. At the present time, neither the South & North Alabama, nor the Louisville & Nashville can obtain the capital necessary to prosecute the work. It therefore follows that in this case the carrier must restrict its traffic to existing facilities; that is, must refuse to undertake to move traffic in excess of its facilities.

Foreign Railroad Notes.

A Russian company engaged in fishing on the Pacific coast asks for special car-load rates on salted herrings over the Siberian Railroad to Russian stations, where they will compete with herrings from the Caspian Sea.

The Province of Buenos Aires, Argentina, has authorized the government to contract with the firm of Otto Bemberg & Company to build a considerable mileage of railroad having its outlet at the port of La Plata, which is on the estuary of that name some 40 miles southeast of the city of Buenos Aires.

The Swiss seem to be a deliberate people. For some time there has been a great deal of discussion of plans to make an outlet to their railroads through the Eastern Alps. Now the general management of the State Railroads reports to the Parliament that to examine these plans and come to a conclusion will take eight years.

The Chinese are contemplating the building of a railroad from Hankow, the river terminus of the long railroad from Pekin southward, westward to a point on the Yang-tse-Kiang above the rapids which interpose between long stretches of navigable stream above and below. A preliminary survey of the most difficult part of the line has been made by Chinese engineers, assisted, or perhaps superintended, by some Japanese—which is an event in the history of China.

France also has its train robbery, with the latest modern improvement, namely, an automobile to escape on. The robbers, three in number, took a first class compartment, made their way on the foot-board of the cars to the baggage car, in which two mail agents had charge of money packages, wounded both of them with pistol shots, and threw out the money packages. The wounded agents succeeded in pulling the cord which signalled the engineman to stop; but when the train slowed down the robbers jumped out. Accomplices had picked up the money and followed the train on an automobile, the track there being alongside the highway, and it picked up the men when they left the train and rushed away without observing the legal speed limit.

Cylinders of Simple and Compound Locomotives of Equivalent Power.

The following table has been compiled and put into practice for proportioning the diameters of the cylinders of two and four-cylinder compound locomotives when designing them to generate a power equivalent to that of a given size of simple cylinder and of the same piston stroke.

It will be noticed that in the earlier list adopted in 1897, at the time when compound locomotives were being pushed to the front most strenuously, the average ratio of area of the simple cylinders and the high-pressure cylinders of the compound locomotives was 1 to 1.17 and 1.026 for two-cylinder and four-cylinder engines respectively. This has been found to be too low in practice with the result that new ratios of 1.25 for the two-cylinder and 1.10 for the four-cylinder have been proposed and are in use. The table gives the area of the simple cylinders from 12 in. to 22 in. in diameter with the corresponding diameters and areas of the high-pressure cylinders of the compound locomotives. In the case of the four-cylinder machines the area given is that of the sum of the two high-pressure cylinders.

Table Showing Actual and Relative Areas of Simple and of Two-Cylinder and Four-Cylinder Compound Locomotives.

Simple.			Sizes of compound cylinders, according to list in effect on and after July 20th, 1897. 2-cylinder compound.			4-cylinder compound.			Proposed sizes of compound cylinders. 2-cyl. compound; Ratio, 1.25.		4-cyl. compound; Ratio, 1.10	
Diam.	Area.	Ratio.	Diam.	Area.	Ratio.	Diam.	Area.	Ratio.	Nearest diam.	Area.	Nearest diam.	Area.
12 in.	113,098	1.00	13 in.	132,733	1.17	8½ in.	113,490	1.00	13⅜ in.	140,501	8⅞ in.	123,725
13 "	132,733	1.00	14 "	153,938	1.16	9½ "	141,764	1.07	14½ "	165,130	9⅝ "	145,510
14 "	153,938	1.00	15 "	176,715	1.15	10 "	157,080	1.02	15⅝ "	191,748	10⅜ "	169,082
15 "	176,715	1.00	16 "	201,062	1.14	10½ "	173,180	.98	16¾ "	220,354	11⅛ "	194,411
16 "	201,062	1.00	17 "	226,981	1.13	11½ "	207,738	1.04	17⅞ "	250,948	11⅞ "	221,507
17 "	226,981	1.00	18½ in.	268,803	1.18	12 "	226,196	1.00	19 "	283,529	12⅝ "	250,370
18 "	254,470	1.00	19½ "	298,648	1.17	13 "	265,466	1.04	20¼ "	318,099	13⅜ "	281,002
19 "	283,529	1.00	20½ "	330,064	1.16	13½ "	286,278	1.01	21¼ "	354,657	14⅛ "	313,400
20 "	314,160	1.00	22 "	380,134	1.21	14½ "	330,260	1.05	22⅝ "	393,203	14⅞ "	347,564
21 "	346,361	1.00	23 "	415,477	1.20	15 "	353,435	1.02	23½ "	433,737	15⅝ "	383,496
22 "	380,134	1.00	24 "	452,390	1.19	16 "	402,124	1.06	24⅝ "	476,259	16⅜ "	421,196
Average					1.17			1.026				

Winter Wheat Crop.

The Crop Reporting Board of the Bureau of Statistics of the Department of Agriculture finds, from the reports of the correspondents and agents of the bureau, as follows: The newly seeded area of winter wheat is estimated as being 1.9 per cent. less than the area sown in the fall of 1906—equivalent to a decrease of 596,000 acres and a total acreage of 31,069,000. The condition of winter wheat on Dec. 1 was 91.1 ,as compared with 94.1 on December 1, 1906, 94.1 at the corresponding date in 1905, and a 10-year average of 93.0.

The following table shows for each of the principal states the percentage of acreage sown to winter wheat this fall as compared with that sown last year, the estimated acreage sown this fall, the average of condition on Dec. 1 of the present year, the corresponding average for 1906, and the mean of the December averages for 10 years:

States.	Acreage compared with last year.	Acres, 1907-'08, preliminary.	Avg. condit'n Dec. 1. 1907.	1906.	10-year average.
Kansas	100	5,930,000	95	95	95
Indiana	100	2,779,000	91	95	90
Missouri	98	2,271,000	93	91	92
Ohio	96	2,126,000	84	97	94
Nebraska	105	2,359,000	93	98	88
Illinois	101	2,381,000	91	94	94
Pennsylvania	98	1,626,000	86	98	94
California	91	1,519,000	88	90	94
Oklahoma	95	1,379,000	94	93	93
Texas	78	988,000	93	94	93
Michigan	93	896,000	87	89	94
United States	98.1	31,069,000	91.1	94.1	93.0

GENERAL NEWS SECTION

NOTES.

On the El Paso & Southwestern an order has been issued forbidding the running of locomotives backward at night. Yard engines are excepted.

The United States District Court for the Eastern district of Virginia has held that to make a ticket non-transferable, when the fact of non-transferability has not been shown in the tariff, is illegal.

The Nebraska State Railroad Commission, acting on the complaint of the National Refining Company of Omaha and others, has voted to order the railroads to make a reduction of 30 per cent. in the rates for the transportation of oil.

The Ontario Railway and Municipal Board, after repeated tests, has approved Quinn's automatic emergency air-brake and fender for electric cars, a device which, when any obstruction is touched, causes the fender to be lowered and the air-brakes applied.

A press despatch from Oklahoma City says that the railroads of Oklahoma will provide separate cars for negroes February 4, borrowing the necessary cars from their lines in other states. Separate acommodations are now being provided at the stations, but, according to the press despatch, "the two races are not compelled to separate."

The Committee on Car Efficiency of the American Railway Association, Arthur Hale, Chairman, has issued Bulletin No. 11, showing surpluses and shortages of freight cars November 13 and November 27. The shortages amounted to 57,000 on the earlier date and to 18,000 on the later date, indicating that the shortages (aggregating 90,000) which were reported October 30 have been nearly wiped out. The surpluses November 27 amounted to 40,000.

It is announced that early in January the New York, New Haven & Hartford will establish a freight steamship line between New York and Boston direct, putting on the line three new vessels, the Massachusetts, the Old Colony and the Bunker Hill. Boats will leave either city three times a week, starting at 5 p. m., and reaching destination at 1 p. m. the next day. These vessels are capable of making 20 knots an hour and are said to be faster than any other freight steamers in American waters.

It is again reported that the state of North Carolina and the railroads (except the Atlantic Coast Line) have agreed on a uniform basis of passenger rates and that Governor Glenn will call a special session of the Legislature. Governor Glenn says that the Legislatures of other states will probably be called together. This latest agreement is said to be based on the adoption by the railroads of a general rate on all passenger business, interstate and intrastate, of 2½ cents; 2,000-mile books to be furnished for the use of firms and their employees to the number of five persons at flat 2 cents a mile, interstate and interchangeable; 2,000-mile books for family use, a number unlimited, at 2 cents a mile, with 500-mile family books at 2¼ cents.

Congress is in session now and nearly everybody who wants to have anything done puts his desires in the shape of a proposition to enact a law. No branch of the Adullam Club has yet been established in Washington, but there would seem to be a good field for one. The Texas cattle shippers have asked Congress to compel the railroads to furnish an adequate supply of stock cars. Judge Cowan, of Texas, has told President Roosevelt that Congress should declare the present railroad rates of the country the maximum legal rates, to be increased only on authority of the Interstate Commerce Commission. Evidently regarding this a mild measure, the Judge proposes also that the National Legislature shall compel the railroads to give adequate service. One Congressman has introduced a bill to require railroads to install automatic stops at "selected points" along all of their lines where the speed of trains is more than 30 miles an hour. Other Members of Congress have been asked by certain alleged locomotive engineers to provide for federal inspection of locomotives. Commissioner Lane favors a law empowering the Interstate Commerce Commission to summarily suspend any tariff increasing rates, if shippers complain; the old rates to remain in effect until the proposed increase can be investigated.

New York Railroad Club Entertainment.

On December 20, the New York Railroad Club instead of its usual program devoted the evening to a smoker and vaudeville entertainment at its usual meeting place, the Engineering Societies Building. The affair, which was the first of its kind which the club had given for 30 years, was a great success. More than two-thirds of the 1,400 members of the club were present. The entertainment committee succeeded in getting for the vaudeville especially satisfactory teams, all men, from theatres in and near New York. There were half a dozen numbers and the performers caught the crowd and amused them from the very first. After the vaudeville the club members spent the rest of the evening in the banquet hall, where refreshments were served.

Trains Under the Hudson River March 7.

The Hudson & Manhattan Railroad Company has asked for a two months' extension of time in which to begin the operation of its railroad under the Hudson river, between Manhattan and Jersey City, and the same has been granted by the New York State Public Service Commission. The company was required to operate its line under the river by January 7. In its application the company said:

"We are prepared to operate, as required by the franchise of the New York & Jersey Railroad Company, on or before the 7th day of January, 1908, that portion of the line extending from the center of the Hudson river to Christopher and Greenwich streets, but we do not believe that such operation would be of advantage to the public. If the time for such operation be extended to the 7th day of March, 1908, we shall be prepared to operate a through line from Hoboken to 14th street and Sixth avenue. We believe that the interests of the public will be better conserved by an extension of the time for 60 days. At all times the work has been prosecuted in good faith and with all possible diligence. The completion has been delayed by unexpected obstacles and natural causes beyond our control."

The Cement Products Exhibition.

The Cement Products Exhibition Company held its first exhibition in the Coliseum, Chicago, Dec. 17 to 21 inclusive. It was a success from every standpoint. All available space in the main section of the Coliseum was taken, and the attendance far exceeded expectations. The Northwestern Cement Products Association held its convention in conjunction with the exhibition, using the annex to the Coliseum for a meeting hall.

The total number of exhibitors at the exposition was 105. Among them were the following:

Allis-Chalmers Co., Milwaukee, Wis.
American Steel & Wire Co., Chicago.
American System of Reinforcing, Chicago.
Condron & Sinks Co., Chicago.
Expanded Metal & Corrugated Bar Co., St. Louis, Mo.
General Electric Co., New York.
Robert W. Hunt & Co., Chicago.
Inland Steel Co., Chicago.
Arthur Koppel Co., New York.
Lansing Wheelbarrow Co., Lansing, Mich.
McKelvey Machinery Co., Chicago.
Northwestern Expanded Metal Co., Chicago.
Thos. Prosser & Son, New York.
Universal Portland Cement Co., Chicago.
Western Electric Co., Chicago.

Steel Ties.

It is an important item of news that L. P. Friestedt of Chicago has bought from James E. York the United States patent rights covering the York cross rolling processes. Mr. York's process for making steel ties out of old rail was fully described and illustrated in the *Railroad Gazette*, November 24, 1905. Neither the process nor the plant necessary for it, is costly. It is evidently applicable to merchant steel of I-beam section as well as to old rail. The difficulty with the Carnegie longitudinally rolled steel tie is, primarily, that the width of either the upper or the lower face of the tie is limited to between 7 and 8 inches, while in the cross rolling process there is no width limit whatever. Moreover, in the cross rolling process any curvature can be made in the surfaces, to the end of making a section with a spring, or resiliency, somewhat corresponding to that of a wooden tie, provided the engineer can design such a form. Still further any indentation that the engineer may design can be made for the purpose of prevention of spreading of track—similar to the office of the shoulder tie plate. The sum of it is that by this process an all-steel tie can be economically made if the engineers can design a form of tie and clips which will make the long enduring steel tie safe for high speed traffic. The experience of the Bessemer & Lake Erie with the rigid Carnegie tie seems to have demonstrated that it is safe and economical for the extremely heavy

loads and comparatively low speeds of less than 40 miles an hour permitted on that road. But the safe steel tie for high speed, and especially in frozen ballast, does not yet seem to have been developed. The remarkable energy and skill shown by Mr. Friestedt in his invention and development of the channel bar steel piling makes the new undertaking hopeful.

Pig Iron Furnaces in Dull Times.

In previous periods of business depression and reduced demand for iron, resulting in the blowing out of blast furnaces, it has been noticeable that the number of furnaces out of blast has been a much larger proportion of the whole number than the reduction of the output. But now we see that while the number of furnaces in blast fell off 27½ per cent., from 304 to 226, from Nov. 1 to Dec. 1, their weekly output fell off 31½ per cent., from 491,436 to 347,372 tons. The average capacity of furnaces in blast was 1,617 tons per week Nov. 1 and only 1,537 tons Dec. 1. The explanation is, probably, that nearly the whole plant of the country at this time consists of modern furnaces of large capacity; while in earlier periods there have been many furnaces of small capacity which could produce at a profit only when the demand was great and prices high. Now, the situation of the furnace and the nature of its products are the chief determining factors.

Transatlantic Travel.

Up to Dec. 6, all records for transatlantic travel have this year been exceeded by a wide margin, and the steerage business, incomparably the most profitable of a modern steamship company's resources, is becoming more and more phenomenal every week. The streams of immigration and of emigration are now crossing one another; the inbound rush has not abated, while the outward movement is heavier than it has ever been before, doubtless because of the slackened demand for labor. The figures are as follows:

	Westbound. Jan. 1-Dec. 6			Eastbound. Jan. 1-Dec. 6		
	1907.	1906.	Inc.	1907.	1906.	Inc.
First-class	104,049	93,391	10,658	97,158	89,742	7,416
Second-class	220,125	181,260	38,865	101,048	84,461	16,587
Third-class	1,316,369	1,151,148	165,221	483,442	315,706	167,736
Totals	1,640,543	1,425,799	214,744	681,648	489,909	191,739

Abandonment of a Street Railway Justified.

The Railroad Commission of Ohio, acting on the complaint of Bickerstaff, has refused to call to account the Steubenville, Mingo & Ohio Valley and the Steubenville & Wheeling Traction companies for ceasing to operate a part of their line over the high summit known as Altamont, between Mingo and Steubenville. Certain persons had been induced to purchase lots on Altamont by reason of the promise that an electric line service would be afforded. After the line had been built the county authorities relocated the low-level highway along the river, and the company at great expense built a new track into Mingo. The commission holds that the change was warranted. According to the press despatches, it is said in the opinion that when the state charters a road to parallel and compete with another the first road may be justified in abandoning that portion of its line which suffers by reason of the competition allowed by the state. The chief reason assigned by the commission, however, for upholding the company in its abandonment of the Altamont line is that the line is hazardous to operate. It is unnecessary to operate it as the general public is provided for by the operation of the low-grade division.

Fairbanks-Morse Motor Inspection Car.

Our attention has been called to a typographical error which appeared in the description of this car printed in the *Railroad Gazette* Dec. 6. The statement about the consumption of lubricating oil should be that the car used 1 gallon of oil in 517 miles.

Prize Awarded M. Cuenot by French Academy.

The French Academy of Sciences has awarded M. Cuenot a prize for his study of Track Deformations, which was published in serial and in book form by the *Railroad Gazette*.

INTERSTATE COMMERCE COMMISSION RULINGS.

St. Louis-Little Rock Rates Reduced.

In an opinion rendered by Commissioner Prouty, the Commission has announced its decision in the case of the Merchants' Exchange of St. Louis against the Missouri Pacific. The rates on grain and grain products from St. Louis to Little Rock and other points in Arkansas, 18 cents on wheat and its products and 15 cents on coarse grains and their products, were declared unlawful, so far as applied to grain which has been carried to St. Louis by railroad from points outside that city. The 18-cent rate is ordered reduced 5 cents and the 15-cent rate 4 cents.

Time-Limit for Presentation of Claims.

An official interpretation of the two years limitation provision of the law of June, 1906, has been made by the Interstate Commerce Commission.

"Claims filed since August 28, 1907, must have accrued within two years prior to the date when they were filed, otherwise they are barred by the statute. Claims filed on or before August 28, 1907, are not affected by the two years' limitation in the act.

"The Commission will not take jurisdiction of, or recognize its jurisdiction over any claims for reparation or damages which are barred by the statute of limitations as interpreted by the Commission; and the Commission will not recognize the right of the carrier to waive the provisions of the statute.

"Commissioner Harlan, voting in the negative on the above interpretation of the limitation of the act, desires to be recorded as holding that the limitation in this act, like the limitations in other acts, does not affect the jurisdiction of the Commission, but is a personal privilege that may be waived by defendants in proceedings before the Commission. He expressed himself also as inclined to the view that a defendant who offered to waive the bar of the statute, as to one claimant, might be required by the Commission also to waive it as to all other claimants whose claims involved the same rate or issue, in order to avoid discriminations."

TRADE CATALOGUES.

West Shore Electrification.—Bulletin No. 4546 of the General Electric Company, Schenectady, N. Y., consists of a detailed description of the electrification of the West Shore Railroad between Utica, N. Y., and Syracuse. There are a number of illustrations from photographs of cars, roadway and substations and drawings showing plans of substations and the third rail construction. An interesting feature is the comparison of train sheets before and after electrification, indicating the great increase in train movement.

Boiler, Pipe and Roof Coverings.—The Philip Carey Co., Cincinnati, Ohio, is distributing a new descriptive catalogue of its coverings. These include 85 per cent. carbonate of magnesia, 85 per cent. magnesia, normal, magnet, standard asbestos moulded, air cell and felt pipe brands of coverings; magnesia flexible cement roofing, and asbestos materials, roofing paints and cements. These different coverings are illustrated and described, the illustrations being excellent half-tone engravings from wash drawings or photographs. The book is 6 in. x 9 in., printed on calendared paper, and has 70 pages.

MANUFACTURING AND BUSINESS.

W. R. Burrows, Eastern Sales Manager of The Buda Foundry & Manufacturing Co., Harvey, Ill., has resigned to go into other business.

J. W. Ager, electrical aide in the Bureau of Yards and Docks, United States Navy, has been appointed Manager of the Southern office at Birmingham, Ala., of Muralt & Co., engineers, 114 Liberty street, New York.

Robert H. Blackall, Assistant to the General Manager of the Westinghouse Air Brake Co., Pittsburgh, Pa., has been made Manager of the Railway Supplies Department of the Pittsburgh Lamp, Brass & Glass Co., Pittsburgh, Pa.

The additions which the Boston Elevated is making to its power stations are nearly finished. The improvements are in charge of the Stone & Webster Engineering corporation, Boston, Mass., and include two new 2,700 k.w. Allis-Chalmers direct current generators.

Alfred Lovell, Consulting Engineer, 819 Harrison building, Philadelphia, Pa., in addition to the lines of work recently mentioned in this column, will make a specialty of examinations, reports on, and specifications for, power plants, shops, machinery and mechanical facilities, and also questions of operation.

The firm of Parker & Lee, 20 Broad street, New York, will be dissolved on December 31, when Ivy L. Lee takes charge of the publicity department of the Pennsylvania Railroad. The business will be continued at the same address by the new firm of Parker & Bridge, consisting of George F. Parker and Charles A. Bridge, who was Manager for the old firm.

The firm, of Manning, Hanchett & Young, Consulting, Mechanical, Civil and Electrical Engineers, has been formed with office at 237 Fulton street, New York, and 824 Equitable building, Baltimore,

Md. W. T. Manning, Mem. Am. Soc. C. E., was on the Baltimore & Ohio for many years, resigning as Chief Engineer in 1899. G. T. Hanchett has for the last ten years been a consulting engineer in New York, his previous work having been mostly electrical. He is a member of several electrical societies. W. D. Young, Mem. Am. Soc. Mech. Eng., has been Electrical Engineer of the Baltimore & Ohio since 1896.

A report prepared for the receivers of the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., by Haskins & Sells, public accountants, shows the following assets and liabilities:

Assets.	
Property and plant	$21,548,403
Investments	30,104,453
Working assets	17,942,065
Quick assets	10,317,612
Other accounts and notes receivable	5,274,092
Contingent assets	2,296,256
Total	$87,482,881
Liabilities.	
Capital stock	$27,938,100
Funded debt	21,319,000
6 per cent. collateral notes, due August, 1910	6,000,000
5 per cent. collateral notes due October, 1917	2,702,702
Current liabilities	13,961,352
Subscriptions	1,559,514
Reserve for possible shortage in inventories	211,955
Contingent liabilities	2,296,256
Profit and loss, surplus	11,494,002
Total	$87,482,881

Iron and Steel.

The Baltimore & Ohio is said to be in the market for 35,000 tons of rails, and to be negotiating with the United States Steel Corporation and the Pennsylvania Steel Company.

OBITUARY NOTICES.

Luman F. Parker, General Solicitor of the St. Louis & San Francisco, died suddenly on December 16. He was born at Lexington, N. Y., on September 26, 1847, and was educated in common schools in Connecticut and at the New Britain, Conn., High School. When he was 22 years old, he went west, living first at St. Charles, Mo., and the next year moving to Union. There he taught school and studied law, being admitted to the bar in Franklin county in 1874. He moved to Rolla, Phelps county, the same year and practiced law there until 1889. He then went to Washington, where he was for some months on the legal staff of General John W. Noble, Secretary of the Interior. The same year he returned to Missouri as trial attorney for the St. Louis & San Francisco. He was appointed General Attorney in 1892 and in 1896 was promoted to be General Solicitor, which position he held at the time of his death.

L. F. Parker.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

The Short Line Association.

"The Short Line Association" is the name of an organization which it is said has been formed by certain railroad companies operating each less than 200 miles of line, the primary object of the organization being to work for more satisfactory compensation for carrying the United States mails. The President of the association is S. F. Smith, President of the Pittsburgh, Shawmut & Northern. It is said that 40 railroads have already joined.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Ohio River & Columbus.—E. H. Blair, Vice-President, has been appointed also General Manager, with office at Ripley, Ohio. The office of Superintendent has been abolished.

Wisconsin Central.—The main office having been moved to Chicago, a general office has been established at 100 Wisconsin street, Milwaukee, Wis., to comply with the provisions of the company's charter.

Operating Officers.

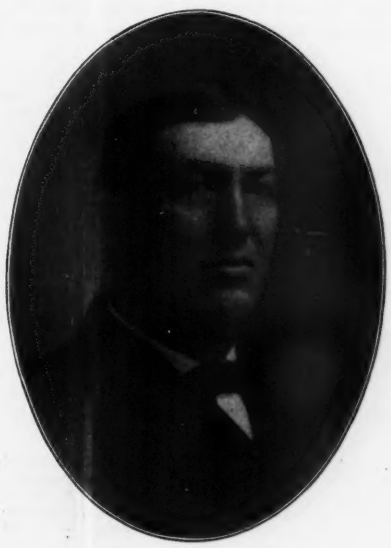
Canadian Pacific.—The changes in General Superintendencies of the Ontario division and the Lake Superior division announced in these columns on December 13 are denied.

Chicago, Milwaukee & St. Paul.—E. W. Morrison, Trainmaster of the La Crosse division, and E. G. Atkins, Trainmaster of the Wisconsin Valley division, have been made, temporarily, chief train despatchers of their respective divisions.

Lake Shore & Michigan Southern.—Dewitt C. Moon, who has succeeded the late E. A. Handy as General Manager of the Lake Shore, was born on July 24, 1856, in western New York. All his railroad service has been on the New York Central Lines. After a common school education he began in 1872 as agent and operator on the Dunkirk, Allegheny Valley & Pittsburgh, one of the lines leased by the New York Central & Hudson River but operated by the Lake Shore. He was made successively despatcher, Trainmaster and, in 1893, Assistant Superintendent. Three years later he was made Superintendent and in 1899 was transferred from the Dunkirk, Allegheny Valley & Pittsburgh to the Rome, Watertown & Ogdensburg division of the New York Central & Hudson River. He was Superintendent of this division for four years and was then appointed Assistant General Superintendent of the Lake Erie & Western. In the fall of 1903 he was made Assistant General Superintendent of the Lake Shore & Michigan Southern and in 1905 was appointed General Superintendent. The next year he was made Assistant General Manager. He is now General Manager of the Lake Shore & Michigan Southern, the Lake Erie & Western, the Dunkirk, Allegheny Valley & Pittsburgh and the Lake Erie, Alliance & Wheeling.

D. C. Moon.

Southern.—Eugene H. Coapman, who was recently appointed Manager of the Northern and Eastern districts, with office at Washington, D. C., was born on August 11, 1865, in Wisconsin. He began railroad work when he was 15 years old on the Chicago, Milwaukee & St. Paul. He was operator and train despatcher from 1880 to 1883 and then went to the Iowa Central as train despatcher. After serving as chief despatcher and Superintendent of Telegraph, he returned to the Chicago, Milwaukee & St. Paul, in 1887, as train despatcher. In 1890 he went to the Illinois Central in the same capacity, being later made chief train despatcher, Trainmaster and finally Terminal Freight Trainmaster. In 1900 he went to the Atchison, Topeka & Santa Fe as Trainmaster and two years later went to the Southern as Superintendent of the Danville division. In December, 1905, he was appointed Assistant General Superintendent of the Eastern district, and in November, 1906, was made General Superintendent of the Northern district, where he remained until appointed to his present position, succeeding the late J. N. Seale.



E. H. Coapman.

W. M. Deuel, who was recently appointed Superintendent of the Coster division, with office at Knoxville, Tenn., has been with the Southern for the last five years. He was yardmaster at Spencer, N. C., for four months and was then for six months Terminal Trainmaster at Birmingham, Ala. In 1903 he was made Assistant Superintendent of the Washington division,

being later transferred to the Knoxville division. He was Superintendent of the Birmingham division for a year and was then made Superintendent of Terminals at Atlanta, Ga., where he remained until his recent appointment.

Engineering and Rolling Stock Officers.

Buffalo, Rochester & Pittsburgh.—H. C. Woodbridge, heretofore Master Mechanic of the Buffalo and Rochester divisions, has been transferred to Du Bois, Pa., to do special work for the Superintendent of Motive Power.

Wisconsin Central.—Harvey Halverson, foreman of the coach department at Fond du Lac, Wis., has been appointed Master Car Builder, with office at that place, succeeding William Percy, resigned to go into other business.

LOCOMOTIVE BUILDING.

The New York, Chicago & St. Louis is said to be asking bids on 20 locomotives. Up to the time of going to press we have not been able to confirm this item.

CAR BUILDING.

The E. A. Bryan Company, Chicago, is asking prices on specialties for 30 cars.

The Porto Rico Railway, through J. G. White & Co., New York, is in the market for 10 box cars and 10 flat cars, all with steel underframes.

The New York, Chicago & St. Louis is said to have ordered 1,000 box cars from Haskell & Barker. We have not yet been able to confirm this item.

The W. C. Lawson Co., Chicago, is said to be considering the purchase of three freight cars. Up to the time of going to press we have not been able to confirm this item.

The Philippine Railways, through J. G. White & Co., New York, have ordered four combination baggage and passenger cars from the American Car & Foundry Company, for March delivery. These cars will be 3 ft. 6 in. gage and will measure 43 ft. 1½ in. long, over end sills, and 9 ft. 6 in. wide. Bodies will be of wood and underframes of steel.

The Missouri, Kansas & Texas has ordered 900 42-ft. gondola cars of 100,000 lbs. capacity and 100 42-ft. dump cars of 80,000 lbs. capacity from the American Car & Foundry Company. The special equipment includes:

Brake-beams	National Hollow, and Damascus
Brasses	Climax
Couplers	Major

The Barrett Manufacturing Co., Chicago, as reported in the *Railroad Gazette* of December 20, has ordered 40 tank cars of 10,000 gals. capacity from the Cambria Steel Co. The special equipment includes:

Brake-beams	Creco
Brasses	Standard Metal Mfg. Co.
Couplers	Climax
Draft rigging	Cardwell
Journal boxes	Symington

The New York, New Haven & Hartford, as reported in the *Railroad Gazette* of December 20, has ordered from Osgood Bradley & Sons 100 passenger cars, 44 of which are vestibuled passenger coaches. The others include: coaches with smoking compartments, combination baggage and smoking cars, combination baggage and passenger cars, combination baggage and mail cars, postal cars and baggage cars. The vestibuled passenger cars will weigh 81,700 lbs. and will measure 60 ft. 2 in. long, 8 ft. 11½ in. wide and 8 ft. 11 in. high, inside measurements, and 68 ft. 8½ in. long, 10 ft. ¼ in. wide and 14 ft. high, over all. The bodies and underframes will be of wood. The special equipment for the vestibuled cars will be as follows:

Bolsters	Commonwealth Steel
Brake-beams	Diamond Special
Brake-shoes	Diamond S, steel back
Brakes	Westinghouse
Brasses	Magnus metal
Couplers	Buhoup
Curtain fixtures	Forsyth
Curtain material	Pantasote
Draft rigging	Sessions friction
Dust guards	Harrison
Heating system	Gold direct steam
Journal boxes	N. Y., N. H. & Hartford's standard
Light	Commercial Acetylene
Platforms	Standard Coupler Co.
Roofs	Canvas
Trucks	Four-wheel
Vestibules	Buhoup
Wheels, make of	Paige plate, steel tires

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Alberta & Northwestern.—Application will be made to the Dominion Parliament for a charter to build a line from a point on the Calgary & Edmonton between Olds and Red Deer northwest along the North Saskatchewan river to a point on the Kootenay plains in the Rocky mountains; also to build a branch to the Brazeau river. McGivern, Hayden & Greig, 19 Elgin street, Ottawa, Ont., are the attorneys.

Atlantic Coast Line.—An officer writes that this company has given contracts to Wade & Bell, Trinity, Fla.; Wade & Morrison, Washington, N. C., and Phillips & Allport, Richmond, Va., for building an extension from Wilcox, Fla., northwest to Perry, 55 miles, for a change of line at Goldsboro, N. C., four miles, and a change of line at St. Mary's River, Fla., 1.5 miles. Surveys are also being made for a change of line on four miles at Inverness, Fla.

Chesapeake & Ohio.—This company is planning to build a branch from Pemberton, W. Va., up Piney Creek, about two miles long.

Delaware & Hudson.—This company during the past year has laid third and fourth tracks to be used by electric cars between Boston Junction, N. Y., and Saratoga, 5.31 miles.

Gulf, Colorado & Santa Fe.—Contract is reported let to John Scott & Sons, of St. Louis, for work on 21 miles of the extension from Center, Tex., northwest to the Texas & Gulf at Zuber. The work is to be finished by April 1. (Oct. 18, p. 473.)

Illinois Traction (Electric).—Track laying has been finished on the Mackinaw-Lincoln branch, closing the last gap in the line from St. Louis via Bloomington to Peoria. The line has been in operation for some time between Lincoln and St. Louis and between Bloomington and Peoria. The overhead work between Lincoln and Mackinaw is to be finished this month and the line opened for traffic early next year. Regular service will then be inaugurated between Peoria and St. Louis, 165 miles.

Missouri & North Arkansas.—Contracts are reported recently let for bridging and track laying on the extension of this road between Kensett, Ark., and Cotton Plant. The grading contract from Kensett southeast to the White river has not yet been let. The road is being extended north from Seligman, Mo., to Neosho, and this work is expected to be finished this month. (Nov. 8, p. 573.)

New York, Pittsburgh & Chicago (Electric).—At a recent meeting of this company, organized to build a short trunk line through Pennsylvania, it was decided to make new surveys for the proposed line between Pittsburgh and the summit of the Allegheny mountains, preparatory to beginning actual work early next spring. Joseph Ramsey, Jr., is President. (Mar. 15, p. 388.)

Temiskaming & Northern Ontario.—Contract nas been given to David Chalmers, of Charlton, Ont., for grading seven miles from Outlake Road to Earlton.

York Railways Company.—This company, which was formed by merging many of the electric lines in York county, Pa., has recently given a mortgage to secure funds to build new lines and to make other improvements.

RAILROAD CORPORATION NEWS.

Baltimore & Ohio.—Gross earnings for November, 1907, were $6,998,553, an increase of $72,598; net earnings $2,004,456, a decrease of $444,548. Gross earnings for the five months ended November 30 were $37,230,491, an increase of $2,179,295; net earnings $11,896,900, a decrease of $723,281.

Kansas City Southern.—Gross earnings for November, 1907, were $812,534, an increase of $59,887; net earnings $235,370, a decrease of $84,764. Gross earnings for the five months ended November 30 were $4,358,464, an increase of $785,661; net earnings $1,541,459, an increase of $174,027.

Northern Pacific.—The estimated gross earnings for November, 1907, were $6,364,000, an increase of $600,000; freight earnings increased 10.9 per cent.; passenger earnings, 15.4 per cent., and mail and express earnings decreased 23.2 per cent. The estimated gross earnings for the five months ended November 30 were $34,114,000, an increase of $3,437,000. Of these earnings, freight increased 9.5 per cent. and passenger 21.8 per cent., while mail and express decreased 20.9 per cent.

Rutland Railroad.—The partly estimated income account for the year ending December 31, 1907, is as follows:

	1907.	Change	
Earnings	$3,080,200	Inc.	$281,000
Expenses	2,227,200	"	249,100
Net earnings	$853,000	Inc.	$31,900
Other income	47,600	Dec.	2,400
Gross income	$900,600	Inc.	$29,500
First charges and taxes	746,100	"	24,800
Available for dividend	$154,500	Inc.	$4,700
Dividend (1.5 per cent., preferred)	135,900		.....
Surplus	$18,600	Inc.	$4,700